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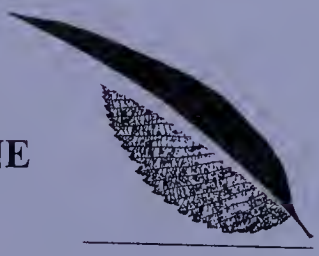

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NEW SAXICOLOUS SPECIES OF *DITREMIS* Clements (LICHENIZED ASCOMYCOTINA, MONOBLASTIACEAE) FROM NEW ZEALAND AND HAWAII

P.M. McCarthy*

ABSTRACT

McCarthy, P. M. New saxicolous species of *Ditremis* Clements (Lichenized Ascomycotina, Monoblastiaceae) from New Zealand and Hawaii. ***Muelleria* 8(1): 1–4 (1993).** — *Ditremis laevigata* McCarthy sp. nov. and *D. pacifica* McCarthy sp. nov. are described from New Zealand and Hawaii, respectively. A key to the saxicolous species of *Ditremis* Clements is provided.

INTRODUCTION

Ditremis Clements is a small and predominantly corticolous genus of pyrenocarpous lichens with a trentepohlioid photobiont, fissitunicate asci, colourless 1(-3)-septate ascospores and an hamathecium of anastomosing pseudoparaphyses. In this paper, two new saxicolous species are described from the New Zealand and Hawaii.

THE SPECIES

Ditremis laevigata McCarthy, *sp. nov.*

Thallus epilithicus, continuus vel areolatus, laevigatus, pallide griseoviridis vel pallide fuscogriseus. Algae ad *Trentepohliam* pertinentes. Perithecia semiimmersa, (0.17-)0.24(-0.32) mm diametro. Involucrellum 30–45 µm crassum. Asci fissitunicati, 8-spori, cylindrici vel cylindroclavati, (63-)72(-83) × (13-)14(-16) µm. Ascosporae 1-septatae, obovatae vel clavatae, (12-)16.5(-22.5) × (4.5-)6(-7) µm.

HOLOTYPUS: New Zealand, South Island, Dunedin, Bethune's Gully, 45°50′S, 170°33′E, on smooth siliceous rock, 4 feet above water level, Feb. 1957, *J. Murray 1619* [part (OTA; ISOTYPUS AK 192342)].

Thallus epilithic, crustose, determinate, continuous to areolate, pale grey-green to pale brownish grey, UV−, K−, colour scarcely changing when wetted with water, matt, smooth, 0.06–0.1(-0.14) mm thick, impregnated with rock crystals. *Areolae* 0.3–0.6(-1) mm wide, regular or irregular, angular or rounded, plane. *Algae Trentepohlia*-like, subglobose, 7–14(-18) × 7–12(-14) µm. *Mycobiont cells* 2–3(-4) µm wide. *Prothallus* not apparent. *Perithecia* compound, semi-immersed, very numerous, usually solitary, (0.17-)0.24(-0.32) mm diam. *Apex* rounded. *Involucrellum* dull black, extending almost to excipulum-base level, 30–45 um thick. *Ostiole* apical, in a 20–30 µm wide depression. *Centrum* subglobose to globose, 0.15–0.23 mm diam. *Excipulum* pale to dark brown at the base, medium to dark brown nearer the apex, 11–16 µm thick. *Pseudoparaphyses* richly branched and anastomosing, septate. *Periphyses* absent. *Asci* fissitunicate, cylindrical to cylindro-clavate, 8-spored, (63-)72(-83) × (13-)14(-16) µm; contents IKI+ red-brown. *Ascus* wall 1.5–2.5 µm thick at the sides, 4.5–6 µm thick at the apex, IKI−; ocular chamber 1–2 µm wide, 1–2.5 µm tall, truncate or pointed. *Ascospores* colourless, 1-septate, irregularly biseriate in the ascus, obovate or clavate, distal cell usually larger, uniformly thin-walled, usually slightly constricted at the septum, (12-)16.5(-22.5) × (4.5-)6(-7) µm (64 measured); surface smooth, without an epispore; contents clear to finely granular. *Conidiomata* numerous, semi-immersed,

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black above, colourless below, 0.06–0.1 mm diam., with a non-convoluted conidiogenous layer and unbranched conidiophores. *Microconidia* and *macroconidia* not seen. (Fig. 1A, B).

Other Specimen Examined

New Zealand — South Island, Otago Peninsula, Broad Bay, Styles Creek, on siliceous rocks beside stream in shady bush gully, 1 Jun. 1991, *P. N. Johnson 201* (CHR 414088).

Discussion

Ditremis laevigata is known from two localities in south-eastern New Zealand where it inhabits damp sheltered siliceous rocks. Although microconidia were not seen in the typi, 3–5(-6) × 2–3 µm propagules were seen in *Johnson 201.*

The new lichen may be distinguished from the boreal *D. carinthiaca* (Steiner) R. C. Harris [typus: Austria, Carinthia, near Klagenfurt, *J. Steiner* (W-syntypi !; US-isosyntypus !)] which has 0.13–0.25 mm diam. perithecia, with a centrum of 0.09–0.13 mm diam., 40–53 µm long asci, ascospores of 9–15(-17) × 3.5–6.5 µm and narrowly ellipsoid microconidia of 3–4.5 × 1–2 µm [seen only in the synonymous *Anisomeridium dimidiatum* (Fink) R. C. Harris; typus: United States of America, Connecticut, Ellsworth, 1895, *H. A. Green* (MICH-holotypus !)]. The newly-described *D. pacifica* (below) has a paler and very much thinner thallus than that of *D. laevigata*, larger perithecia and a discontinuously thicker involucrellum.

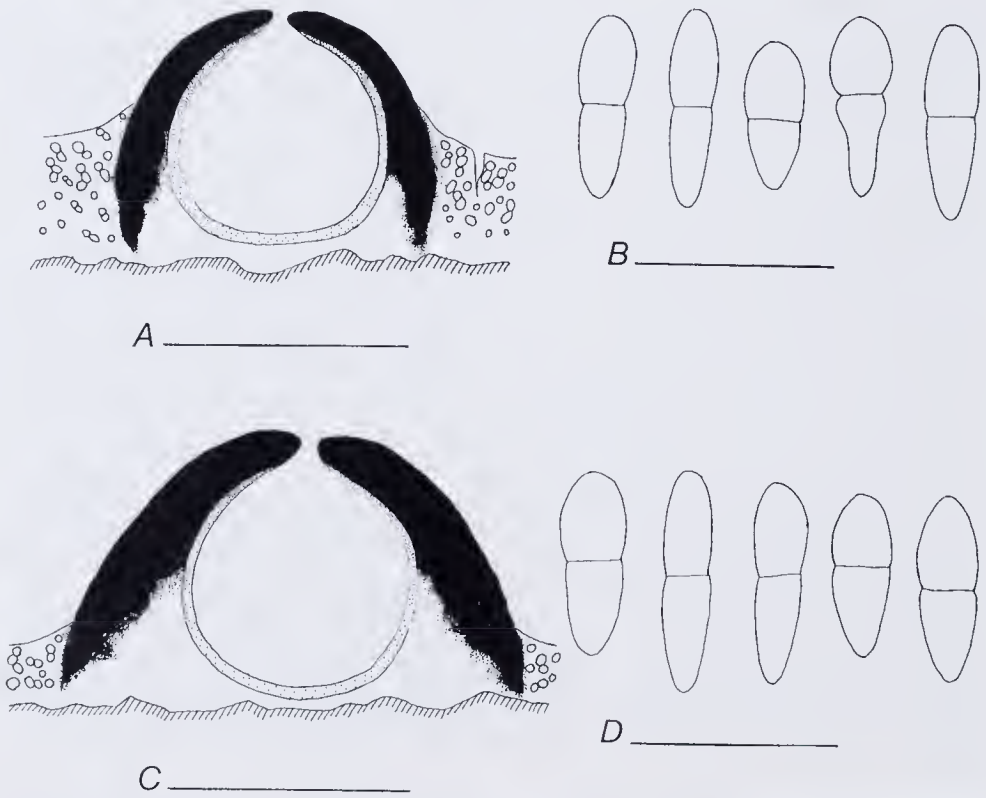

Fig. 1. *Ditremis laevigata.* A — vertical section of perithecium. B — ascospores. *Ditremis pacifica.* C — vertical section of perithecium. D — ascospores. Scales: A and C — 0.2 mm; B and D — 20 µm.

Ditremis pacifica McCarthy, *sp. nov.*

Thallus epilithicus, continuus vel rimosus, pallide viridogriseus. Algae ad *Trentepohliam* pertinentes. Perithecia fere superficialia, (0.24-)0.35(-0.44) mm diametro. Involucrellum 45–65 µm crassum. Asci fissitunicati, 8-spori, elongatae-cylindrici, (68-)75(-83) × (11-)14(-17) µm. Ascosporae 1-septatae, obovatae vel elongatae-ellipsoideae, (15-)18.5(-21.5) × (4.5-)6(-8) µm. Microconidia lata ellipsoidea vel obovata, 3–5(-6) × 1.5–2.5(-3) µm.

HOLOTYPUS: United States of America, Hawaiian Is., Oahu, Mokuleia, gulch NW of Peacock Flats, on shaded boulders in and near stream-bed, alt. 1200 feet, on siliceous rocks, 5 Mar. 1966, *O. & I Degener 30381d* (B 049768).

Thallus epilithic, crustose, diffuse to determinate, continuous to rimose, pale greenish grey, UV−, K−, colour scarcely changing when wetted with water, matt, smooth, 30–60 µm thick, impregnated with rock crystals. *Algae Trentepohlia*-like, subglobose, 7–15 × 7–12 µm. *Mycobiont cells* 2–3 µm wide. *Prothallus* not apparent. *Perithecia* compound, 1/3-immersed to superficial, very numerous, usually solitary, (0.24-)0.35(-0.44) mm diam. *Apex* rounded to somewhat flattened. *Involucrellum* dull black, extending almost to excipulum-base level, 45–65 µm thick, brown-black in thin section. *Ostiole* apical, in a 60–120 µm wide depression. *Centrum* subglobose to globose, 0.16–0.25 mm diam. *Excipulum* pale brown at the base, darkening towards the apex, 11–16 µm thick. *Pseudoparaphyses* richly branched and anastomosing, septate, 0.7–1 µm wide. *Periphyses* absent. *Asci* fissitunicate, elongate-cylindrical, 8-spored, (68-)75(-83) × (11-)14(-17) µm; contents IKI+ red-brown. *Ascus wall* 1.5–2.5(-3) µm thick at the sides, 4–6 µm thick at the apex, IKI−; ocular chamber *c.* 3 um wide, 1–1.5 µm tall, hemispherical or truncate. *Ascospores* colourless, 1-septate, irregularly biseriate in the ascus, obovate or elongate-ellipsoid, distal cell frequently larger, uniformly thin-walled, usually slightly constricted at the septum, (15-)18.5(-21.5) × (4.5-)6(-8) µm (50 measured); surface smooth, without an epispore; contents clear. *Conidiomata* numerous, semi-immersed to almost superficial, black and hemispherical to subconical above, colourless below, 0.09–0.13 mm diam., with a non-convoluted conidiogenous layer and unbranched conidiophores. *Microconidia* broadly ellipsoid to obovate, 3–5(-6) × 1.5–2.5(-3) µm. *Macroconidia* not seen. (Fig. 1C,D).

DISCUSSION

Ditremis pacifica is characterized by a thin pale thallus, perithecia are larger than those of other known saxicolous *Ditremis*, 1-septate ascospores and ellipsoid to elongate-ellipsoid microconidia. It is known only from its Hawaiian type locality. It is rather close to *D. laevigata*, from which it may be separated by its thinner and paler thallus, larger perithecia and thicker involucrellum.

KEY TO THE SAXICOLOUS SPECIES OF *DITREMIS*

1 Ascospores persistently 1-septate 2
1 Ascospores 1–3-septate 5

2 Thallus endolithic, calcicolous. Perithecia immersed to emergent. Asci 105–125 × 15–18 µm. Ascospores 20–25 × 6.5–8.5 µm. Microconidia 3–5 x 1–1.5 µm. Puerto Rico and Florida (Harris 1990) ..... **D. finkii** R. C. Harris
2 Thallus epilithic, silicolous. Asci less than 85 µm long 3

3 Asci 40–53 x 10–15 um. Ascospores 9–15(-17) × 3.5–6 µm. Perithecia (0.13-)0.19(-0.25) mm diam.; centrum 0.09–0.13 mm diam. Austria, Sweden, north-eastern U. S. A.. (Clauzade & Roux 1985, Harris 1975) ..... **D. carinthiaca** (Steiner) R. C. Harris [syn. *Anisomeridium dimidiatum* (Fink) R. C. Harris]
3 Asci 63–83 × 11–17 µm. Ascospores 12–22.5 × 4.5–8 µm. Perithecia 0.17–0.44 mm diam.; centrum 0.15–0.23 mm diam 4

4 Thallus 60–140 µm thick, pale grey. Perithecia (0.17-)0.24(-0.32) mm diam.; involucrellum 30–45 µm thick. New Zealand..... **D. laevigata** McCarthy
4 Thallus 30–60 µm thick, pale grey-green to pale brown-grey. Perithecia (0.24-)0.35(-0.44) mm diam.; involucrellum 45–65 µm thick. Hawaiian Is. ..... **D. pacifica** McCarthy

5 Ascospores 1–3-septate, 16–22 × 6.5–8 µm. Microconidia narrowly elliptical, 4–5 × 1.5–2 µm. North-eastern U. S. A.. (Harris 1975) ..... **D. distans** (Willey) R. C. Harris
5 Ascospores 3-septate, 21–36.5 × 7.5–13 µm. Microconidia bacilliform, 2.5–4 × 0.7 µm. New South Wales (McCarthy 1992) ..... **D. australiensis** McCarthy

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Manuscript received 21 January 1992.

THE DISCOVERY OF BATRACHOSPERMALEAN TAXA (RHODOPHYTA) IN AUSTRALIA AND NEW ZEALAND

TIMOTHY J. ENTWISLE*

ABSTRACT

Entwisle, Timothy J. The discovery of Batrachospermalean taxa (Rhodophyta) in Australia and New Zealand. ***Muelleria* 8(1): 5–16 (1993).** — The discovery in Australia and New Zealand of species in the freshwater red-algal order Batrachospermales is chronicled. From 1802 to 1930, almost all taxa discovered were included within European species: names were provided by European specialists or taken from European floras. From 1930 to 1972, the Latvian phycologist Heinrichs Skuja devised 17 new names for Australian and New Zealand taxa, but published only three of these before his death in 1972. Recent decades have seen a return to a more conservative approach, perhaps concealing the richness of the flora.

INTRODUCTION

Since European settlement in Australia and New Zealand, aquatic habitats have been devastated by frenzied deforestation and land improvement, coupled with an unquenchable thirst for drinking-water and hydroelectricity. The freshwater red algae — in particular the Batrachospermales — generally favour pristine waters, and have declined in abundance and probably in diversity. Despite sporadic collecting over nearly two centuries, the richness and endemism of the freshwater red algal flora in Australia and New Zealand remains uncertain.

While accumulating material for a monograph of the Batrachospermales in Australia and New Zealand, I have encountered many names which are either unpublished, ambiguous or synonyms of earlier names. Many of these names are better understood in their historical context. In the following account, I have combined information from unpublished correspondence, herbarium vouchers and published works. Ducker (1990) provides a excellent introduction to the history of marine phycology in Australia, and her paper should be consulted for further information on Robert Brown, Ronald Gunn, William Harvey, Joseph Hooker, Arthur Lucas, Florence Perrin and William Woolls. Authorities for the species names mentioned can be found in the index and herbarium abbreviations follow Holmgren *et al.* (1981).

1800–1864: INCIDENTAL ENCOUNTERS

In 1805, Robert Brown (1773–1858) returned to England with three charophytes and one *Batrachospermum* the only freshwater algae in his Australian booty. The *Batrachospermum*, later numbered *187* in the *Inter Australiense* series, languished for 130 years in the British Museum of Natural History before being examined and identified. Based on its eventual determination (see p. 7), Brown probably collected the alga from the Sydney region.

The first *published* report of *Batrachospermum* from Australia was based on specimens collected in Tasmania by Charles Stuart (1802–77), and appeared in *Plantae Muellerianae* (Sonder 1853) under the name of *Batrachospermum moniliforme*. Tasmania remained the focus of phycological interest in Australia, with William Harvey (1811–66) collating all known collections of *Batrachospermum* from that isle (Harvey 1860, 1863). Ronald C. Gunn (1808–81), 'the first resident

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Australian botanist' (Ducker 1990), found a *Batrachospermum* at Launceston in 1844, later identified by Harvey as *B. atrum*. In 1855, surgeon-naturalist David Lyall (1817–95) discovered *B. vagum* and Harvey himself made a further collection of *B. moniliforme*. (All but the Stuart collection are held in Australian herbaria: HO, MEL and NSW.)

Elsewhere in Australia, most colonialists were obliterating all aquatic habitat on auriferous earth. Sonder (1880) included in his list of Australian algae only one additional Batrachospermalean record, *Lemanea australasica*. This name was based on an overmature population of *Batrachospermum* from Paramatta River, Sydney, collected by Rev. William Woolls (1814–93). The collection (held at MEL) is undated but was possibly collected before Woolls's (1867) *Contribution to the Flora of Australia*, where he described the algae of the Paramatta River at some length.

In 1850, five years before he found *B. vagum* in Tasmania, David Lyall collected the first *Batrachospermum* from New Zealand. Joseph D. Hooker (1817–1911) recorded this collection from the Canterbury Plains as *B. moniliforme* (Hooker 1855). Also in the nineteenth century, the British phycologist Mary P. Merrifield (1804–89; née Watkins) gave the name *B. atrum* to an undated, unsited collection from Zealand (BM). In 1857, British clergyman and cryptogamist, Miles J. Berkeley (1803–89), writing in England, remarked that *B. vagum* from New Zealand was 'not distinguishable from specimens gathered on Snowdon [in Wales]' (Berkeley 1857, p. 138).

1865–1929: LOCAL INTEREST

In the latter part of the nineteenth century, New Zealand and Australia both spawned naturalists with at least a passing interest in freshwater algae.

In Australia, the amateur microscopist Henry Watts (1828–89) included two species of *Batrachospermum* in his 1865 list of freshwater algae from Victoria. *Batrachospermum pulcherrimum* and *B. vagum* were names undoubtedly taken from Hassall's (1845) *History of the British Freshwater Algae* (Entwisle 1990). Watts includes only *B. moniliforme* in his revised list of 1887, commenting that 'the nomenclature of Algae has changed so much since [the 1865 list] that this previous list is now obsolete' (Watts 1887, p. 136). Watts had since gained access to the European specialists Friedrich T. Kützing and C. F. Otto Nordstedt — through the assistance of Ferdinand von Mueller at MEL — and to two new publications on freshwater algae by Cooke (1882–4) and Wood (1872). Apparently, Sirodot's (1884) definitive monograph of *Batrachospermum* in Europe had not reached Australian shores.

In New Zealand, William L. Lindsay (1829–80) reported on the freshwater algae following a visit there in 1861–2 (Lindsay 1867), but for the Batrachospermales, he only reiterated Berkeley's note of a decade earlier. William I. Spencer (1832–97) published the only new records of *Batrachospermum* (Spencer 1882) until well into the 1930s. Spencer, an ex-soldier and physician, worked within the same constraints as Henry Watts (e.g. *History of British Freshwater Algae* was his primary source) but without the patronage of European specialists. Even the same suite of names was used: *Batrachospermum moniliforme*, *B. pulcherrimum* and *B. vagum*. An unidentifiable *Batrachospermum* collected by A. Hamilton from Horokiwi River (NW of Wellington) was briefly characterized (Spencer 1882).

While New Zealand went through a 50 year hiatus, collecting continued in Australia. Around the turn of the century, Queensland was ably served by the well-loved and hard-working Colonial Botanist, Frederick M. Bailey (1827–1915). Bailey co-ordinated the efforts of team of local collectors, farming off the algal collections to European specialists, then translating and interpreting their subsequent publications in the *Botany Bulletin of the Queensland Department of Agriculture* (e.g. Bailey 1893, 1895).

Martin A.J. Möbius (1859–1946) in Germany examined three collections of *Batrachospermum* (Möbius 1892, 1895), two by T.L. Bancroft, the other by F. Pigram. The Bancroft collection from Stradbroke Island included only male plants and could not be given a species name, but his collection from Burpengary was identified as *B. vagum* var. *flagelliforme*. Pigram's alga was included in *B. dillenii*, but differed from European material of this species (Möbius 1895; Skuja 1970a). Möbius (1895) also mentioned a collection of *B. dillenii* from Carolinia Creek (= Cardinia Creek), Victoria, by Charles French (1840–1933). This 1887 collection (MEL, UPS) was considered by Möbius to be more like European *B. dillenii*, but was later (Skuja *in sched.*, *c.* 1933) identified as belonging to the closely related genus *Sirodotia*, described by Harald Kylin in 1912. Bailey (1913) summarized the Queensland records in his important *Comprehensive Catalogue of Queensland Plants*.

Arthur H.S. Lucas (1853–1936) opened the account for the twentieth century in 1905, with a collection of *Batrachospermum* from the head of Middle Harbour in Sydney. This may have been where Brown collected 100 years earlier — the collections of Brown and Lucas were later given the same manuscript name (see below). In his 1909 presidential address to the Linnaean Society of New South Wales, Lucas recounted Harvey's Tasmanian records, adding the record from Middle Harbour — as *Batrachospermum* sp. from the eastern coast — and *B. moniliforme* from the southern mainland coast. The record of *B. moniliforme* was presumably that of Alfred D. Hardy (1870–1958), a keen naturalist with a freshwater algal bent (see Entwisle 1990), who found this species at Sydenham, 20 km NE of Melbourne (Hardy 1906). In 1918, Lucas made a further unidentifiable collection of *Batrachospermum*, from Dargens Creek, near Clarence in the Blue Mountains (HO, NSW, UPS).

In Tasmania, Leonard Rodway (1853–1936) made four mixed collections of *Batrachospermum* from mountain streams and lakes between 1910 and 1915 (HO, NSW), naming them either *B. moniliforme* or *B. dillenii*. Over a decade later, Florence Perrin (1884–1952; née Dawson) made the next Tasmanian collections, finding two unidentified species in the Cradle Mountain area in 1928 (HO, NSW).

The Australian booty was now a respectable size. *Batrachospermum* was obviously not uncommon in Australian streams and included at least a handful of species. A few European names had been slapped around and that, as far as the locals were concerned, was that. In New Zealand, a few of the same taxa had been found, but there was little interest in collecting.

1930–1972: THE SKUJA YEARS

This complacency was soon shattered. The pre-war decade marked the start of a spectacular renaissance in collecting of *Batrachospermum* (particularly in New Zealand), blossoming with the entrance of Heinrichs Skuja onto the Australian and New Zealand stages.

Australia, 1930–1934:

Professor Heinrichs Skuja (1892–1972) spent much of his life preparing materials for a world monograph of *Batrachospermum*. In the early 1930s, Skuja was working his way through the herbaria of Europe while soliciting *Batrachospermum* material from around the world. Lucas apparently sent duplicates to Skuja in Latvia. In 1931, Skuja annotated his 1913 specimen from Middle Harbour with the manuscript name *B. ulandrium*. Four years later he gave the same name to Robert Brown's 1802–1805 collection in the British Museum of Natural History. The determination of Lucas's Middle Harbour collection from 1905 as *B. capillaceum* is undated, but presumably occurred during Skuja's Latvian period. Lucas sent his Clarence material (collected in 1918) to Latvia in 1934, where Skuja, although determining the herbarium sheets as *B. dillenii*, allied it

with a Falkland Island alga with the manuscript name of *B. nothogeae* (see Entwisle 1992). Skuja also annotated a 1915 collection from Middle Harbour as *B. dillenii*.

In 1934, Skuja sent out the 4th, 5th and 6th parts of his *Untersuchungen über die Rhodophyceen des Süßwassers* from the University of Latvia. Part five announced the discovery of *Nothocladus* Skuja, a new genus allied to *Batrachospermum* and *Sirodotia*. *Nothocladus nodosus* was typified by a Watts collection from the Yarra River, Victoria, made in the early 1880s (Skuja gives the year of collection as 1884, but Kützing examined the alga prior to February 1882). Skuja found that a duplicate sent to Berlin (B) was in better condition than material in MEL. At Kew (K), Skuja relocated material of *B. vagum* collected by David Lyall from Cataract River, Launceston, in 1855. Skuja (1934) described this alga as a second species of *Nothocladus*, *N. tasmanicus*.

New Zealand, 1936–1972:

In 1936 (or early 1937), Robert M. Laing (1865–1941), a keen and distinguished amateur phycologist living in Christchurch, sent Skuja a bundle of Batrachospermalean collections from New Zealand (Table 1). Most of the collections were provided by Lucy M. Cranwell (later L.M. Smith), who combed the northern end of the North Island between 1931–1935. Laing also included material collected by himself, by Elizabeth A. Flint and the 1850 collection by David Lyall. Skuja (1937) replied with the exciting news of six *Batrachospermum* taxa, four of them new to him (Table 1); *B. fruticans* was a taxon known to Skuja from the 'Antarctic region'. David Lyall's '*B. moniliforme*' from the Canterbury Plain included two new species, both of which were among the collections by Cranwell from the North Island. *Batrachospermum novae-zelandiae* and *B. gallaei* var. *longipilum* were particularly common in the Auckland-Bay of Islands area.These names all appeared in Laing's 1939 list of New Zealand seaweeds.

Skuja fled Latvia on the eve of the Russian occupation in 1944, taking little more than his microscope in an open boat across the Baltic Sea. In the same year, the 7th to 12th parts of his *Untersuchungen über die Rhodophyceen des Süßwassers* were published in the final volume of *Acta Horti Botanici Universitatis [Latvia]*. Skuja reached Uppsala, Sweden, where he was to spend the rest of his life (Willén 1979). Part eight of his last Latvian publication concerned a new species of *Nothocladus* from New Zealand and a comparison between the genera *Nothocladus* and *Tuomeya*. (In part 7, Skuja described an endophytic red alga in *Nothocladus* which he called *Balbiania meiospora*.) *Nothocladus lindaueri* was based on two 1940 collections from Waitangi River, near Russell, part of the exsiccatae of Victor W. Lindauer (1888–1964; see Cassie 1971 for bibliographic details). Another specimen from Lindauer's exsiccatae was given the manuscript name *Batrachospermum gallaei* var. *longipilum*. Clearly, Skuja believed the Batrachospermalean flora of Australia and New Zealand to be quite distinct from that of Europe.

Few other Batrachospermalean algae were discovered in New Zealand in the 1940s and early 1950s. Eileen Willa found some in Fern Gully Creek on Stewart Island in 1945–48. While in New Zealand for three months in 1950, Mary A. Pocock (1886–1977), from Rhodes University, South Africa, collected *Batrachospermum* from near Invercargill with F. Malcolm Corkill. She sent Skuja a small, dried specimen collected from snail shells (Table 1). (In later years, Skuja was eager to examine more epihelicidaeous material, but none was found; Corkill 1969, Flint 1969.) V.J. Chapman *et al.*'s (1957) list of freshwater algae included records from Laing (1939) and Spencer (1882), with some updates to nomenclature, an additional collection of *Sirodotia suecica* by Professor Chapman made in 1955, and two Lindauer exsiccatae (*Nothocladus lindaueri* and *B. gallaei* var. *longipilum*, both from the Bay of Islands area).

Alan Hirsch, from Ann Arbor in Michigan, USA, collected widely in New Zealand during 1957, forwarding five samples to Skuja (Table 1). Skuja recog-

Table 1. Batrachospermaceae collections from New Zealand sent to H. Skuja

Collector and date sent to Skuja[1]	No. of colls	Brief Locality	Names of *Batrachospermum* and *Sirodotia* taxa provided by H. Skuja, and date sent[1,2]
(Laing 1936)			(Skuja 1937)
D. Lyall	1	Canterbury Plains	**B. novae-zelandiae**, **B. campyloclonum**
R. M. Laing	2	Kaipoura & Christchurch	**B. gallaei var. longipilum**, S. suecica
L. M. Cranwell	8	Bay of Islands & Auckland areas	B. dillenii, *B. gallaei* var. *longipilum*, *B. novae-zelandiae*, *B. campyloclonum*.
E. A. Flint	5	Cass, Milford Sound & Inchbonnie	S. fennica, **B. atrichum**, **B. fruticans**, *B. campyloclonum*
(Pocock 1950)			(Skuja 1950)
M. A. Pocock & J.M. Corkill	1	Stewart Island	B. virgato-decaisneanum
(Hirsch 1957)			(Skuja 1957)
A. Hirsch	5	Waitakaruru & Tawhiti Streams & Cam River	**S. ateleia var. australis**, *B. novae-zelandiae*, **B. aff. ectocarpoideum**
(Flint 1961b)			(Skuja 1961)
H. D. Gordon	4	Wellington area	**?var. australe B. anatinum**
C. J. Burrows	3	Esk River & Maruia Springs	*B. campyloclonum*
N. Leov	1	Cleddau River	*B. campyloclonum*
E. Flint	3	Cass area	*B. campyloclonum*
R. Mason	1	Waihopuhopu Creek	S. delicatula
(Flint 1963)			(Skuja 1963)
K. Wise	1	Auckland Island	*B. gallaei* var. *longipilum*
E. C. M. Segar	2	Torbay Falls & Ngarotonga Valley	**B. pullum**, **B. faciferum**, *B. gallaei* var. *longipilum*, Valley **B. sp. nov. (sect. Contorta)**
(Flint 1964a)			(Skuja 1964)
E. Flint	3	Lake Roundabout	*S. fennica*
(Flint 1965)			(Skuja 1965)
E. Willa	10	Stewart Island	**B. lamprogyne**, *B. campyloclonum*
M. Parsons	18[3]	Wellington & Nelson	*B. campyloclonum*
V. Stout	3	Westport	**B. sp. nov. (Waimea Creek)**, **S. suecica var. australis**
(Flint 1969)			(Skuja 1970b, 1970c)
M. Taylor	6	Oamaru area	**B. microspermum**, *B. gallaei* var. *longipilum*, *S. ateleia*
(Flint 1972)			No reply[4]
E. J. Cudby	1	Lake Rotoaira	
F. Hill	15[5]	Waikato River lakes	
V. Stout	3	Milford Track	
M. Taylor	5	Oamaru area	
F. Michaelis	3	Nelson area	

[1] The author and date of the accompanying letters are given in brackets. Lindauer's exsiccatae is not included here.

[2] Bold type indicates the first record of a new taxon, roman type indicates a new record for New Zealand of an existing name, and italics are used for subsequent records of all taxa. Note that if there is more than one sample in a particular batch of a new taxon or record, the presumed earliest collected is in bold type.

[3] Also including species of *Asterocytis, Bostrychia, Hildenbrandia* and *Rhodochorton.*

[4] Skuja was unable to examine this last batch and died soon after its arrival.

[5] Also including species of *Audouinella, Bostrychia* and *Compsopogon.*

nized two new taxa in these collections (one allied to the North American species *B. ectocarpoideum*), and more of his *B. novae-zelandiae* (Table 1). This marked the beginning of an extremely productive period in the discovery of the Batrachospermales in New Zealand. In 1960, Elizabeth Flint took on the role as Skuja's New Zealand correspondent. Flint left Christchurch in the 1930s to study under F.E. Fritsch at Queen Mary College in London, followed by a decade of teaching and further research in England. Since her return to New Zealand in 1955, Flint had worked with the DSIR at Christchurch on the taxonomy and ecology of soil and lake microalgae. Flint replied to an enquiry by Skuja about *Batrachospermum* holdings in New Zealand herbaria with a list from the Auckland Museum supplied by Robert Cooper (Flint 1961a). Meanwhile, Willa had written to Flint promising to collect more *Batrachospermum* from Stewart Island (Willa 1960, 1961).

By mid 1961, Flint had accumulated eleven formalin preserved samples and one dried sheet, the first of six batches she sent to Uppsala (Table 1). Skuja was eager to examine collections from the southern hemisphere, and no wonder. Nearly every batch included previously unknown species, as well as new records for New Zealand (Table 1). Flint provided Skuja with as much habitat information as possible and generally kept him aware of activities in New Zealand. For example, when Skuja identified material from Lake Roundabout, c. 80 km SW of Cass, as *Sirodotia fennica* (Skuja 1964), Flint responded with the informataion that the original site at Cass was now much modified and *S. fennica* was no longer to be found there (Flint 1964b).

Another phycologist impressed with the diversity of Batrachospermales in New Zealand was the idiosyncratic North American, Lewis H. Flint. In 1963, L.H. Flint annotated specimens in Lindauer's herbarium held at the University of Auckland (AKU). Much of the material was collected from the Bay of Islands area by Lindauer, but E. Willa also contributed material from Stewart Island. L.H. Flint identified the following species: *Batrachospermum androgyne*, *B. campyloclonum*, *B. gallaei*, *B. gallaei* var. *longipilum*, *B. islandrinum*, *B. novae-zelandiae*, *Nothocladus lindaueri*, *Sirodotia gardneri* and *S. suecica*. Most of these names (some misspelt by L.H. Flint) were devised by Skuja for New Zealand endemics (Table 1), but *S. gardneri* is a North American species and *B. gallaei* had been reported world-wide. In the same year, James Fox Wilson donated his herbarium to BM, including an undated specimen of *B. atrum* from New Zealand.

To attract new collectors, Elizabeth Flint advertised for freshwater red algal material in the *New Zealand Limnological Society Newsletter* of 1968. She received a favourable return, particularly the steady flow of material from C. Frank Hill, botanist to the New Zealand Department of Electricity in Hamilton (Hill 1969). In March 1972, Flint bundled up 27 samples in her last batch of of freshwater red algae and mailed them to Skuja (Table 1).

AUSTRALIA, 1945–1972:

Australia's inland waters received little attention in the 1940s, but Professor Skuja still had some input. In 1945, H.B. S.. Womersley collected material from Mt Compass, South Australia, which was given the manuscript name *Sirodotia ambigua* by Skuja. Cecil B. Kay (?of the State Electricity Commission of Victoria) collected *Nothocladus nodosus* from Cardinia Creek, near Melbourne, in 1947 (Ducker, pers. comm.; MELU), a sample of which was sent to Skuja for confirmation.

Around 1950, A. D. Hardy found *Batrachospermum moniliforme* in a few of the creeks and reservoir outflows near Melbourne (Hardy 1931–56). Hardy also reported the North American genus *Tuomeya* from Silver Creek, but this was presumably a misidentification of one of the common *Batrachospermum* or *Nothocladus* species found in the Yarra River basin (Entwisle 1989a). In New South Wales, *Batrachospermum* was reported to be common in the Blue Mountains and in National Park near Sydney (McLuckie & McKee 1954).

Just after Christmas 1960, David H. Ashton, a plant ecologist at the University of Melbourne, collected an intriguing alga from the Arthur Range in southwest Tasmania. It was identified as *Lemanea* sp. by his colleague Sophie C. Ducker and remarkably (for such a fascinating record of this genus) filed and forgotten in the University of Melbourne Herbarium (MELU). It has been included recently in an endemic Australian genus allied to *Lemanea* (see following page).

In 1965, Valerie May summarized the state of knowledge in Australia, listing Harvey's three *Batrachospermum* species and the two new *Nothocladus* species in her census and key to the red algae of Australia (May 1965). *Batrachospermum* was still being collected, but the same few names were being used. As her census was being published, Valerie May found an alga in the Flinders Ranges, South Australia, which she identified as *B. atrum*. In 1966, V.H. Jolly & M.A. Chapman reported an unnamed species from Coxs River, New South Wales. Further north, Alan B. Cribb included *Batrachospermum* as part of his extensive freshwater algal collecting in Queensland. Between 1962 and 1986, Cribb made some 30 collections of Batrachospermaceae, all but one from Queensland (the other from Tasmania), and mostly identified as *Batrachospermum* sp. (BRI). A few other Queenslanders were inspired to collect for Cribb during this period.

As in New Zealand, the 1960s marked a revival in interest in the Batrachospermales. In 1966, Peter A. Tyler of the University of Tasmania collected *Batrachospermum* from the pristine streams and lakes of southern Tasmania. In 1968, Tyler, a specialist in the taxonomy of microalgae, sent his *Batrachospermum* collections to Skuja. Skuja excitedly reported back that Tyler had rediscovered *B. nothogeae*, in material from Lake Pedder (see Entwisle 1992). Skuja also identified *B. vagum* and *B. gallaei* var. *longipilum* in Tyler's collections, noting that Möbius's (1895) record of *B. dillenii* from Queensland was neither *B. dillenii* nor his own *B. gallaei* var. *longipilum*.

It was *Batrachospermum nothogeae* that excited Skuja. Tyler tried unsuccessfully to collect more of this taxon later in that year (from the nearby Lake Maria complex), in 1969 (from North Lake in the Mt Picton area) and in 1970 (from a creek flowing into Lake Pedder). All collections were referable to Skuja's *B. gallaei* var. *longipilum* — interesting but not captivating! Finally, at the insistence of Skuja, Tyler sent the remainder of his original 1966 collection to Uppsala in March, 1972 (Entwisle 1992). Coincidentally, it was in the same month that Elizabeth Flint in New Zealand mailed off her last batch to Skuja.

EPITAPH:

Neither Tyler in Australia nor Flint in New Zealand heard further from Skuja. In 1970, he suffered a stroke from which he never fully recovered, and died on the nineteenth of July, 1972 (Thomasson 1974). At the same time in Tasmania, 'waters impounded behind a dam built by the Hydro Electric Commission of Tasmania. . .merged with those of Lake Pedder', leading to the submergence and destruction of 'one of the most beautiful, if not the most beautiful lake in Australia' (Bayly & Williams 1973). Tyler's collection from the beach of Lake Pedder became irreplaceable.

1973–1992: AFTER THE FLOOD

Part of Lake Pedder's precious algal cargo at least has been resurrected. The 1972 samples of Flint and Tyler, still in their packaging, were sent from UPS to MEL in 1981. Last year, the centenary of Skuja's birth, *B. diatyches* was described for an apparently uncommon *Batrachospermum* from Tasmanian mountain lakes (Entwisle 1992).

In the twenty years since Skuja's death, some progress has been made in the discovery and classification of the Batrachospermales in Australia. Of note is the

establishment *Psilosiphon scoparium*, a new genus and species of Lemaneaceae. In 1984, Adrienne Harding and Brian Gunning, plant physiologists at the Australian National University, discovered this *Lemanea*-like plant at Barren Grounds, *c.* 100 km SSW of Sydney. The Tasmanian '*Lemanea*' collected by D.H. Ashton in 1960 also belongs to this species (Entwisle 1989b).

An introductory account of the freshwater red algae of south-eastern Australia was published in 1984 (Entwisle & Kraft 1984), followed by some further refinement to their classification in 1989 (Entwisle 1989a). Names included in these two publications and not previously reported from Australia were: *Batrachospermum ectocarpum* (as *B. boryanum* in 1989), *B. helminthoideum* (as *B. gelatinosum* in 1989), *B. keratophytum* and *B. virgato-decaisneaum*. In the same period, a few more or less incidental records were published, but no new names used (e.g. Chessman 1982, Cribb 1987, Ling & Tyler 1986). A number of nomenclatural changes resulted from Necchi & Entwisle's (1990) subsumption of all species of *Nothocladus*, *Sirodotia* and the North American *Tuomeya* into the genus *Batrachospermum*.

In New Zealand, the death of Skuja marked the end of a brief but fruitful (in collecting terms at least) revival. Aside from a brief note recounting the loss, and rediscovery in 1964 of *Sirodotia fennica* near Cass (Flint 1977, *fide* Cassie 1984), Flint's 1966 paper is the most recent record of Batrachospermales included in Vivienne Cassie's (1984) *Revised Checklist of the Freshwater Algae of New Zealand*.

The distinctiveness or otherwise of the Australian and New Zealand Batrachospermalean flora is under review. My own approach in the 1980s was to accommodate as far as possible the southern hemisphere taxa within existing European species. This seemed a practical solution when faced with the uncertain application of existing names, coupled with widely varying species concepts (due primarily to a lack of understanding of phenotypic variability). Skuja obviously followed a different path, circumscribing his taxa far more narrowly. Now, with access to a wide range of Australian and New Zealand material, as well as to northern hemisphere types and other vouchers, a more considered approach should be possible.

ACKNOWLEDGEMENTS

Thanks to Dr Elizabeth Flint (DSIR, Christchurch) for her considerable help in accumulating and locating information on New Zealand Batrachospermales, and to Dr Sophie Ducker (University of Melbourne) for her generous assistance with Australian records. Drs Flint and Ducker are also thanked for their critical comments on earlier drafts of the manuscript. Dr Flint and Dr Peter Tyler (University of Tasmania) kindly gave me access to their correspondence. Thanks also to Dr Torbjörn Willén (Uppsala University) for access to the unpublished notes of Heinrichs Skuja. The staff of AD, AKU, BRI, CANB, NSW, HO and WELT kindly provided loans of specimens (unfortunately, specimens from CHR were unavailable at the time of writing). Dr Valerie May (Herbarium of New South Wales) searched (unsuccessfully) for Skuja correspondence in NSW, and Dr Edgars Vimba (Latvian State University) was unable to find any correspondence or notes pertaining to Skuja.

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INDEX TO NAMES OF ALGAE MENTIONED IN TEXT

Only nomenclatural and published taxonomic synonyms are given (abbreviations follow Stearn 1983, p. 367–72); a full taxonomic synonymy based on examination of types (where available) will be included in the forthcoming monograph. The conclusions of Compère (1991) are accepted here.

[1] Although the latter name appears in Skuja's manuscripts two years after Flint's herbarium determinations.

[2] In an unpublished note at the University of Uppsala, Skuja annotates a drawing of *B. ectocarpoideum* with '?*B. boryanum* × *B. moniliforme*'. The drawing is based on a specimen sent to Skuja by L.H. Flint on 30.xi.1948.

INDEX TO NAMES OF PEOPLE MENTIONED IN TEXT

Manuscript accepted 7 April 1992

HYBANTHUS STELLARIOIDES NEW COMBINATION (VIOLACEAE), A WIDESPREAD SPECIES FROM EASTERN AUSTRALIA AND PAPUA NEW GUINEA

PAUL I. FORSTER*

ABSTRACT

Forster, Paul I. *Hybanthus stellarioides* new combination (Violaceae), a widespread species from Eastern Australia and Papua New Guinea. ***Muelleria* 8(1): 17–19 (1993).** — *Hybanthus stellarioides* is newly recognised at specific rank, based on *H. enneaspermus* var. *stellarioides* Domin. It is widespread in coastal and subcoastal areas of eastern Australia in New South Wales and Queensland and has been recorded once from southern Papua New Guinea.

INTRODUCTION

A taxonomic revision of the genus *Hybanthus* Jacquin in Australia was presented by Bennett (1972), and adapted with little change for a 'Flora of Australia' treatment by George (1982). In both of these accounts, *H. enneaspermus* (L.) F. Muell. is considered to comprise two subspecies, with subsp. *enneaspermus* widely distributed in subtropical and tropical Australia, Malesia, Asia and Africa whereas the subsp. *stellarioides* (Domin) E. Bennett is endemic to eastern Australia.

Bennett (1972) separates the two subspecies with the following key:

"1. Stipules long (up to 4 mm). Margins of leaf closely revolute, usually glabrous, but if pubescent then hairs spreading. Flowers blue ..... subsp. enneaspermus
1. Stipules short (± 1 mm). Margins recurved, leaves up to 5 mm wide, hairs always antrorse. Flowers yellow ..... subsp. stellarioides"

H. enneaspermus subsp. *stellarioides* is based on *H. enneaspermus* var. *stellarioides* Domin, described from a plant collected by Domin at Yarraba near Cairns in north Queensland.

To some extent, the recognition and rank of taxa of plants remain subjective. Some taxonomists now recognise 'species' on as little as single-character discontinuity, whereas others prefer three or more. Where subspecies are recognised, there should be allopatry of the taxa concerned.

In the case of the two subspecies of *H. enneaspermus*, there are four reliable discontinuities in morphological characters, namely the key characters of Bennett (1972). Although both Bennett (1972) and George (1982) map the two subspecies and provide a verbal description of distribution, no information is given as to the ecological preferences of the taxa or as to whether or not they occur as allopatric entities and whether or not they intergrade.

By and large *H. enneaspermus* subsp. *enneaspermus* and *H. enneaspermus* subsp. *stellarioides* are sympatric, although generally allotypic throughout the area of eastern Australia where both occur. *H. enneaspermus* subsp. *enneaspermus* is commonly found in coastal areas often near the sea, although it is also common in rocky areas in eucalypt dominated communities in subcoastal areas and over much of northern tropical Australia. By comparison, *H. enneaspermus* subsp. *stellarioides* is common in sandy areas in eucalypt dominated communities from coastal to subcoastal areas. It is rare to see the two taxa growing together; however, I have seen and collected both in close proximity in the Embley Range area in Cook District, Mt Aberdeen in North Kennedy District and the Didcot area in Wide Bay District. No intermediates occur in the areas where the taxa coexist.

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Given the lack of intermediates and the relatively high number of morphological discontinuities between the two, it is concluded that both taxa should be recognised at specific level and the relevant change of status for *H. stellarioides* is made.

TAXONOMY

Hybanthus stellarioides (Domin) P. Forster *comb. et stat. nov.*

Basionym: *Hybanthus enneaspermus* var. *stellarioides* Domin, Biblioth. Bot. 89: 983 (1928); *H. enneaspermus* subsp. *stellarioides* (Domin) E. Bennett, Nuytsia 1: 229 (1972). Typus: Queensland, Cook District, in rupibus collis apud. opp. Yarraba, Jan. 1910, *K. Domin 6794* (Holotypus: PR *n.v.*).

Illustration: K.A.W. Williams, Native Pl. Queensl. 1: 161 (1979).

Annual herb to 30 cm high. *Stems* with scattered to sparse, antrorse to divaricate simple trichomes. *Leaves* alternate, subsessile; lamina linear, linear-lanceolate or elliptic-ovate, 12–80 mm long, 2–8 mm wide, discolorous, entire or with occasional marginal tooth; venation obscure, with scattered to sparse trichomes; margins recurved, never revolute. *Stipules* linear, 0.8–1 mm long; venation obscure. *Flowers* solitary in leaf axils; peduncle filiform, 3–13 mm long, glabrous or with scattered indumentum; bracts triangular, 0.6–1 mm long, *c.* 0.3 mm wide; pedicels 2–4.5 mm long, with scattered to sparse indumentum. *Sepals* lanceolate-ovate, 2.5–4.5 mm long, 0.8–1.2 mm wide, glabrous or with scattered trichomes. *Corolla* orange; anterior petal spathulate, 10–14 mm long, 5–9.5 mm wide; outer lateral petals linear-oblong, 3–4.2 mm long, 1.3–1.5 mm wide; inner lateral petals lanceolate-falcate, 4–5 mm long, 1.8–2 mm wide. *Filaments* filiform, dimorphous, 3 posterior ones short, 2 anterior ones ± equal in length to anthers and with hair- tipped nectaries; *anthers* elliptic-oblong, 0.7–0.8 mm long, *c.* 0.5 mm wide. *Capsule* 5.5–7.5 mm long, 3–6 mm diameter; seeds 5–10, ovoid-ellipsoid, 1.8–2.2 mm long, 1.2–1.4 mm diameter, usually longitudinally ribbed and ± pitted between the ribs, yellow.

Distribution and Conservation Status

Widespread in subcoastal and coastal eastern Australia, from central New South Wales more or less continuously in subcoastal and coastal eastern Australia northward to near Cairns. There are a few apparently disjunct collections on Cape York Peninsula and one collection from southern Papua New Guinea.

The species is very common and not rare or threatened.

Habitat

H. stellarioides grows in sandy or rocky soils of various types in eucalypt-dominated open forests from near sea level up to 500 m altitude. Flowering plants are most noticeable in late summer and autumn, with seeding occurring from autumn onwards. In most instances the plants appear annual, as opposed to *H. enneaspermus* which appears to be at least biennial.

Representative Specimens (66 specimens examined)

Papua New Guinea — Western Province, Penzara between Morehead and Wassi Kussa Rivers, Dec. 1936, *L.J. Brass 8434* (BRI).

Queensland — Cook District, Iron Range, 11 June 1948, *L.J. Brass 19128* (BRI); Northern base Round Mt, Embley Range, 13 June 1992, *P.I. Forster 10458 & T. Kenning* (BRI); Turtle Beach, Lizard Island, 7 Oct. 1988, *G.N. Batianoff 10341* (BRI). North Kennedy District, Mt Aberdeen National Park, 29 May 1992, *P.I. Forster 10005 et al.* (BRI); "Taravale" near Hell Hole Creek, 22 Mar. 1987, *B.R. Jackes 8711* (BRI). South Kennedy District, Horseshoe Bay, Keswick Island, 36 km NE of Mackay, 26 Mar. 1989, *G.N. Batianoff 11099* (BRI); Peak Downs Highway, 17 km W of Moranbah turnoff, 26 Mar. 1989, *I. Champion 436* (BRI). Leichhardt District, Salvator Rosa National Park, 28 Mar. 1983, *M.E. Ballingall 999* (BRI); Blackdown Tableland, *c.* 32 km SE of Blackwater (campsite on Mimosa Creek), 24 Apr. 1971, *R.J. Henderson 816 et al.* (BRI). Port Curtis District, Dry Creek close to Forestry Bar-

racks, Kroombit Tops, 64 km SW of Calliope, 16 Dec. 1983, *P.R. Sharpe 3461* (BRI); State Forest 365, 6.5 km SSE of Yarwun, 14 Apr. 1989, *N. Gibson TOI535* (BRI). Burnett District, Mt Margaret, State Forest 28, 28 Apr. 1990, *P.I. Forster 6724* (BRI); 1 km N of Little Morrow Creek crossing, Eidsvold to Cracow road, 9 Apr. 1992, *P.I. Forster 9736* & *P. Machin* (BRI). Wide Bay District, Clifton Range, State Forest 676, 11 km N of Brooweena, 3 Apr. 1992, *P.I. Forster 9699* (BRI); Didcot Creek, "Nora Creina", Didcot, 1 Dec. 1981, *P.I. Forster 302B* (BRI). Moreton District, 2 km N of Coolum Beach, 27 Dec. 1975, *P.R. Sharpe 1890* (BRI); Mt Gravatt University Site, Brisbane, 12 Feb. 1968, *R. Henderson H178* (BRI).

New South Wales — Eastern spur of Mt Clunie, MacPherson Range, 5 Apr. 1953, *R. Melville 3615* & *T. Hunt* (BRI).

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TWO NEW SPECIES OF *BORONIA* (RUTACEAE) ENDEMIC IN VICTORIA

D.E. Albrecht and N.G. Walsh*

ABSTRACT

Albrecht, D.E. and Walsh, N.G. Two new species of *Boronia* (Rutaceae) endemic in Victoria. ***Muelleria* 8(1): 21–25 (1993).** — Two new species of *Boronia* (*B. citrata* and *B. galbraithiae*) endemic in eastern Victoria, are described and illustrated. Their ecology, distribution and conservation status and relationships with other species are discussed.

INTRODUCTION

In this paper we describe two new endemic species of *Boronia* for Victoria. They are not recent field discoveries but have been segregated as a result of more thorough study of specimens previosly referred to *B. muelleri* (Benth.) Cheel and *B. citriodora* Cunn. *ex* Hook. at the National Herbarium of Victoria (MEL). Both new species appear to belong to the *B. pilosa* Labill. group *sensu* Weston *et al.* (1984).

The terminology used to describe inflorescence structures follows Briggs and Johnson (1979).

TAXONOMY

Boronia citrata N.G. Walsh *sp. nov.*

a *Boronia citriodorae* foliolorum hispidulis, obtusis parvioribus, stylo breviōribus, ovario tomentoso; a *B. pilosae* petiolis longiorum, foliolorum obtusis, indumento denso aequaliter, petalis et sepalis non-acuminatis, et aromatis citreis valde differt.

Holotypus: Victoria, Eastern Highlands, 6.4 km E of Licola, Victorian Plant Grid S35, *A.C. Beauglehole 43385* with *E.A. Chesterfield* and *J.H. Willis*, 21 Oct. 1973 (MEL 542677).

Pungently lemon-scented shrub, to 0.8 (rarely to c. 1.5) m high. *Branchlets* terete or weakly 4-angled, not obviously glandular, moderately to densely hispidulous with hairs 0.1–0.2 mm long. *Leaves* imparipinnate, to 15 mm long and wide, with hairs resembling those of branchlets but slightly sparser; *petioles* 1.5–3.5 mm long, swollen apically; rachis segments resembling petiole; *leaflets* 5–11, spreading, narrowly obovate, obtuse, 2–7 mm long, 1–3 mm wide, terminal leaflet shortest, concolorous, veins obscure; margins rounded, entire or slightly and irregularly indented. *Inflorescence* terminal or in upper axils, 1–5 flowered; peduncle 0–5 mm long, hispidulous; prophylls of primary axis paired, linear, 1–2 mm long; anthopodia 3–7 mm long, hispidulous, broadening shortly below the calyx. *Sepals* triangular, 1–1.6 mm long, 1–1.5 mm wide, minutely hispidulous. *Petals* pale to rosy pink, mostly darker apically and abaxially, 4–6.5 mm long, 2–3 mm wide; surfaces minutely and densely papillate, with very short, fine, erect hairs superimposed. *Staminal filaments* 1.5–2 mm long, alternating longer and shorter, glandular-tuberculate, pilose, swollen apically; anther connective 0.2–0.3 mm long; *anthers c.* 0.5 mm long, lacking terminal appendage. *Disc* swollen, maroon, 1.5–2.5 mm diam., glabrous. *Ovary* hispidulous; style 0.25–0.4 mm long, glabrous or sparsely pilose just below the rounded, slightly broadcr stigma. *Fruiting cocci*

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flattened-ovoid or ellipsoid, 3–3.5 mm long, hispidulous; *seeds* dark brown, shining, 2–3 mm long. (Fig. 1 a-c)

ETYMOLOGY

From the Latin *citratus* meaning lemon-like, alluding to the aromatic foliage of the species. Despite the proximity of this name to *B. citriodora*, the lemon scent in both species is such an apparent attribute that the similarity of names is warranted. Confusion of 'field abbreviations' of the species names is unlikely as they are endemic in different states.

OTHER SPECIMENS EXAMINED

Victoria — from type locality: 20 Oct. 1973, *J.H. Willis s.n.* (MEL 503637); 15 Jul. 1973, *E.A. Chesterfield s. n.* (MEL 516720); 21 Feb. 1989, *J. Westaway 617* (MEL 694529); 28 Apr. 1992, *D.E. Albrecht 4967* with *N.G. Walsh* (MEL); Subalpine moors near Mt Macdonald, 21 Mar. 1973, *E.A. Chesterfield s. n.* (MEL 1608227).

DISTRIBUTION AND CONSERVATION STATUS

Known from 2 areas in the Macalister River catchment in areas to the north and east of Licola. One site containing about 5 distinct populations (including the Type), ranging over about 1 km is within the Alpine National Park (Wonnangatta-Moroka Unit). The other site, near Mt MacDonald (about 4 populations spanning about 0.5 km), is within uncommitted crown land, but at sites unlikely to experience altered land management and are considered not at risk. Within most of the populations plants of *B. citrata* are plentiful. The area covered by the populations at each of the two sites is about 3–5 ha (E.A. Chesterfield, pers. comm.). Another population was reported to occur by the late W.R. Cane of Maffra, apparently near to the Mt MacDonald site (E.A. Chesterfield pers. comm.), but this population has not been confirmed by any living botanist and details of its location are sketchy.

The Risk Code (*sensu* Briggs & Leigh, 1989) for *B. citrata* is assessed as 2RCa.

HABITAT AND ECOLOGY

Boronia citrata occurs on shallow, shaly soils based on Carboniferous and Ordovician sandstones at altitudes of about 950–1140 m. At the type locality *Eucalyptus sieberi* and a mallee form of *E. dives* form a low open-forest with understorey species including *Epacris impressa, Daviesia buxifolia, Comesperma ericinum, Monotoca scoparia, Oxylobium ellipticum, Tetratheca labillardieri, Dillwynia phylicoides* and *Hibbertia obtusifolia*. Near Mt MacDonald *B. citrata* occurs in similar vegetation, but with *Eucalyptus mannifera* and *E. dives* being the principal canopy species, and *Acacia obliquinervia* and *Pultenaea muelleri* prominent components of the shrub stratum (along with most of the shrub species present at the type locality).

NOTES

Boronia citrata has in the past been confused with Tasmanian *B. citriodora*. This is understandable as both have foliage which is strongly lemon-scented when crushed. However *B. citrata* differs from *B. citriodora* in its leaflets which are obtuse at the apex, hispidulous and smaller (those of *B. citriodora* being acute or apiculate, glabrescent and the largest leaflets >8 mm long); in its shorter style (*c.* 1 mm long in *B. citriodora*); in the hispidulous ovary and fruit (glabrous in *B. citriodora*); and in the terete or weakly angled and evenly hispidulous branchlets (rather strongly 4-angled with alternating glabrescent and hispidulous faces in *B. citriodora*). The two differ further in their habitats. Although both inhabit subalpine sites, those from which *B. citrata* is known are dry, with skeletal soils derived from sandstones whereas *B. citriodora* typically inhabits wettish peaty sites usually developed on quartzite or dolerite substrates.

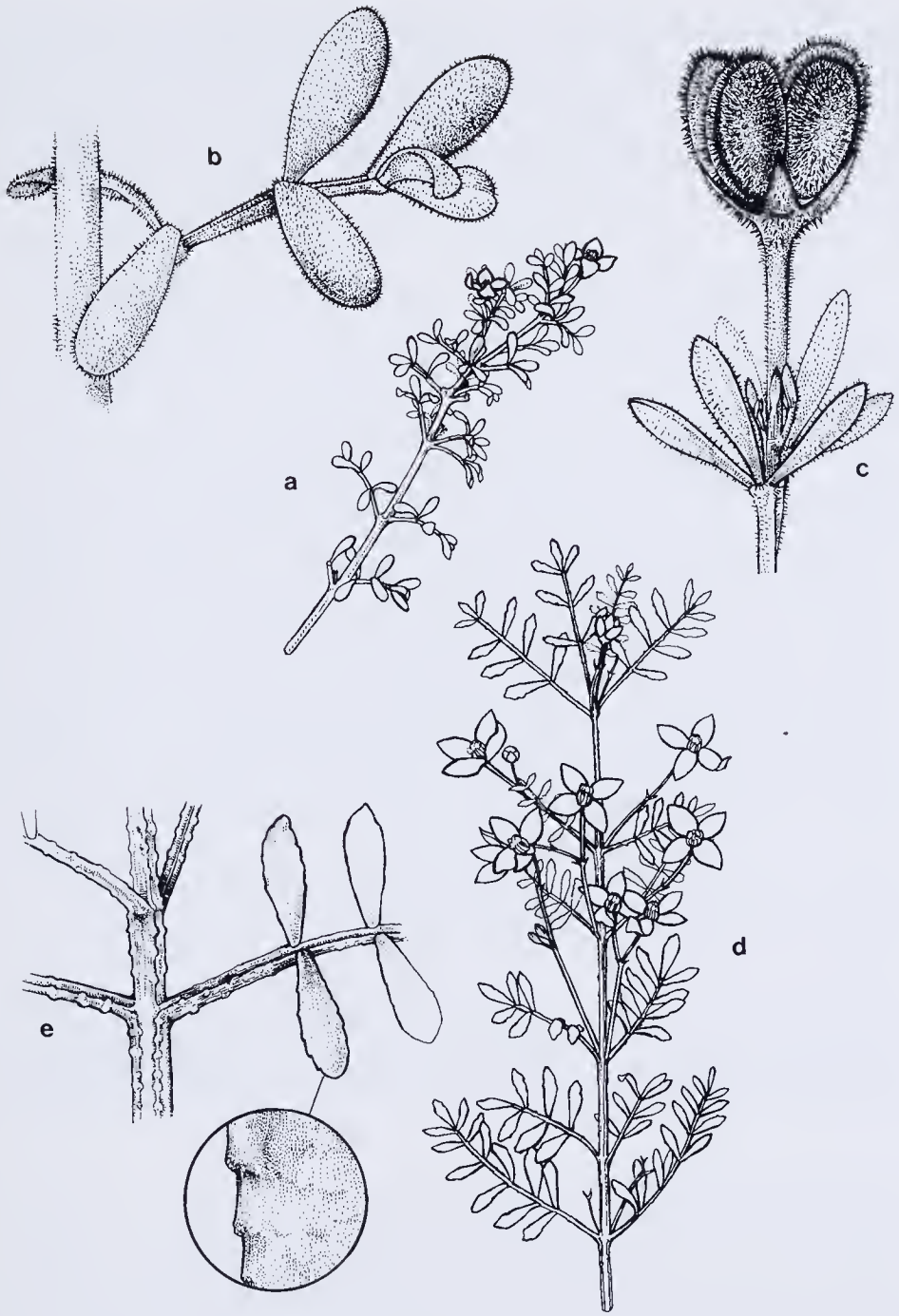

Fig. 1. *Boronia citrata.* a — flowering twig, ×1. b — leaf and stem, ×6. c — fruiting cocci, ×6. All drawn from *Albrecht 4967* (MEL). *Boronia galbraithiae.* d — flowering twig, ×1. e — part of leaf and stem, ×3 and (inset) leaflet margin. All drawn from *Albrecht 1965* (MEL).

Boronia citrata resembles some forms of the widespread *B. pilosa* which occurs in South Australia, Victoria and Tasmania, but is readily separable from that variable species in the longer petioles (<1.5 mm long in *B. pilosa*); in the obtuse leaflets (acute in *B. pilosa*, except in a glabrous form from far western Victoria and probably south-eastern South Australia); in the shape of the sepals and petals (acuminate and apiculate respectively in *B. pilosa*); in the dense even tomentum (hairs typically scattered and of unequal lengths in *B. pilosa*); and in the distinctive lemon foliar fragrance.

Boronia galbraithiae D.E. Albrecht *sp. nov.*

Boronia muelleri affinis foliolorum brevioribus, oblanceolatis vel obovatis, serrulatis valde, et odore feniculi differt; *B. microphylla* similis sed ramulis glabris anguste alatis, foliolorum serrulatis et antheris non-apiculatis differt.

Typus: Victoria, Eastern Highlands, S of Cobbannah, 26 Sept. 1984, *A.C. Beauglehole 77328*; Holotypus: MEL 669258; Isotypi: MEL 669259, CBG, NSW, HO, CHR).

Pleasantly fennel-scented shrub to 2 m high. *Branchlets* glabrous, 4-angled, with glandular-tuberculate decurrent leaf bases forming flanges along the internodes, becoming sub-terete with age. *Leaves* imparipinnate, to 25 mm long, glabrous; petioles 3.5–8 mm long, glandular-tuberculate, channelled above; rachis to 25 mm long, segments similar to but slightly shorter than the petioles; leaflets (3-)5–15(-17), oblanceolate to narrowly obovate, obtuse to subacute, apiculate, 2–9.5 mm long, 1–3 mm wide, terminal leaflet shortest, lower surface paler, gland dots ± obscure; margins plane, glandular-serrulate, the teeth verrucose. *Inflorescence* axillary, (1-)3–5(*c.*15)-flowered; peduncle 5–12 mm long, 4-angled, glandular-tuberculate, glabrous; prophylls of primary axis entire to pinnate (and resembling the leaves), to 7 mm long, glabrous; anthopodia 2.5–7 mm long, broadening towards the calyx, glabrous. *Sepals* ovate-triangular, glabrous, 1–2 mm long, 1–1.4 mm wide. *Petals* white to deep pink, 4.5–7.7 mm long, 2.5–5.8 mm wide, minutely pubescent to glabrous adaxially, glabrous abaxially, not persistent in fruit. *Staminal filaments* 1.5–3 mm long, alternating longer and shorter, glandular-tuberculate, pilose, swollen apically; anther connective 0.2–0.3 mm long; anthers 0.5–0.7 mm long, terminal appendage absent. *Disc* 1.6–2.1 mm diameter, glabrous. *Gynoecium* glabrous; style 0.3–0.4 mm long; stigma rounded, about as wide as the style. *Fruiting cocci* flattened ovoid, c.4 mm long, glabrous; seeds almost black, shiny, 2–2.3 mm long. (Fig. 1 d-e)

Etymology

The species is named in honour of Miss Jean Galbraith, doyenne of Victorian botanists, who first brought our attention to the distinctness of this taxon, and whose collections and writings have contributed much to our knowledge of flora of the Gippsland region.

Other Specimens Examined

Victoria — from type locality — Oct. 1956, *J. Galbraith s.n.* (renumbered as *A.C. Beauglehole 7099*); 14 Oct. 1956, *J. Mathew s.n.*; 29 Sept. 1985, *D.E. Albrecht 1965* (MEL 1585677, 1585703); 27 Apr. 1992, *D.E. Albrecht 4968* with *N.G. Walsh* (MEL).

Distribution and Conservation Status

Boronia galbraithiae is only known from uncommitted crown land in the vicinity of Mt Difficulty, where it is it patchily distributed for about two kilometres along the Insolvent Track. Although the population occupies a small area plants of *B. galbraithiae* are locally plentiful. Applying the coding system of Briggs & Leigh (1989) *B. galbraithiae* is assigned a risk code of 2Ri.

Habitat and Ecology

Boronia galbraithiae occurs in dry sclerophyll forest on skeletal spurs and upper slopes between about 420 and 540 m altitude. The soil is shallow and derived from Ordovician sediments. Associated species include *Eucalyptus sieberi*, *Persoonia confertiflora*, *Platysace lanceolata*, *Dillwynia phylicoides*, *Chionochloa pallida* and *Poa* sp. aff. *gunnii*.

Part of the population of *B. galbraithiae* was recently burnt by a low intensity fire. Within this area plants were observed to be resprouting from rootstocks and some seedling recuitment was also evident.

Notes

Specimens of *Boronia galbraithiae* have previously been referred to *B. muelleri*, a species of scattered distribution between the Victorian Otways and far south-eastern New South Wales. However, *B. galbraithiae* differs from *B. muelleri* in its consistently shorter leaflets (the longest leaflets <10 mm long, *cf.* >10 mm long in *B. muelleri*), that are oblanceolate to narrowly obovate (narrowly ellipic in *B. muelleri* except for one specimen from the Genoa Gorge in far eastern Victoria with oblanceolate leaflets), distinctly serrulate (entire or slightly serrulate in *B. muelleri*) and have a aroma resembling fennel when bruised. Furthermore, the young stems of *B. galbraithiae* are invariably glabrous compared to glabrous to sparsely hairy in *B. muelleri*, and plants of *B. galbraithiae* rarely reach 2 m high (and are typically below 60 cm) whereas plants of *B. muelleri* range in height from about 1–7 m. The two species also differ in their habitat preferences. *B. galbraithiae* occurs in dry sclerophyll forest on skeletal spurs and upper slopes, whilst *B. muelleri* occurs in moister and often more sheltered sites in riparian and damp sclerophyll forests, *Banksia* woodland and wet heathland.

Boronia galbraithiae also superficially resembles the eastern New South Wales and Queensland *B. microphylla* Sieb. ex Spreng., but differs from that species in its glabrous stems that have conspicuous flanges along the internodes (those of *B. microphylla* being bristly when young and lacking flanges); in its glandular-serrulate leaflets (entire in *B. microphylla*); and in its non-apiculate anthers (minutely apiculate in *B. microphylla*).

ACKNOWLEDGEMENTS

We are grateful to Jean Galbraith (Tyers, Victoria) whose enquiry led to the realization that the two species were undescribed, to Evan Chesterfield (Department of Conservation & Natural Resources, Victoria) who discovered *B. citrata* and supplied detailed ecological information about the species, John Eichler (Black Rock, Victoria) and James Turner (Kalimna West, Victoria) for information regarding the populations of the new species, to Allen Trumbull-Ward, Geoff Beilby and John Davies (Department of Conservation & Environment, Victoria) for collections of and information regarding *B. muelleri*, and to our colleague Anita Barley for illustrating the new species.

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GONOCARPUS PYCNOSTACHYUS (F. Muell.) Orch. (HALORAGACEAE) REDISCOVERED

A.E. ORCHARD*

ABSTRACT

Orchard, A.E., *Gonocarpus pycnostachyus* (F. Muell.) Orch. (Haloragaceae) rediscovered. ***Muelleria* 8(1): 27–29 (1993).** — An ephemeral herb, *Gonocarpus pycnostachyus*, previously known only from its Type, collected near Israelite Bay on the south coast of Western Australia in 1888, has been rediscovered near Mt Heywood and Mt Merivale, north-east of Esperance. An expanded description is provided, the ecology of the species discussed, and its relationships with other species outlined.

INTRODUCTION

Gonocarpus pycnostachyus was described by Ferdinand Mueller (1888) from a plant collected by Miss S. Brooke 'near Israelite Bay' in Western Australia. The original specimen was lodged in the Melbourne herbarium, with a duplicate being sent to Berlin, where it was examined by Schindler in preparing his monograph of the family (Schindler 1905). The Berlin duplicate was subsequently destroyed during World War II.

Subsequent workers (Blackall & Grieve 1965; Orchard 1975; Orchard 1990) have therefore been obliged to base their descriptions of species on just a single specimen, as no further material had come to light in the century following its original collection. While the Type consisted of adequate material to permit a full description, the fact that no additional material was available hampered efforts to elucidate its relationships and distribution. The possibility always existed that this was nothing more than an extreme form of the related taxa from the same general area. The conservation status of the species was also problematical. Briggs & Leigh (1989) rated it as 1K [=Known only from Type; Poorly Known] in their list of rare or threatened Australian plants.

In the early summer of 1991 a bushfire burned a roughly north-south swathe through shrubland to the north-east of Mt Heywood, 85 km north-east of Esperance. This area was visited by Mr William R. Archer of Mt Merivale in late December 1991. He found a species of *Gonocarpus* colonising the newly-burnt area in large numbers. This species has now been confirmed as being *G. pycnostachyus*, and a suite of collections are lodged in herbaria in Hobart, Perth and Melbourne (HO, PERTH, MEL).

These collections provide an insight into the ecology of the species, as well as an indication of variability. *G. pycnostachyus* appears to be a pioneer species, annual or at most a short-lived perennial, appearing after fire. This would partly explain the absence of collections in the last 100 years — the frequency of fires in the shrublands of southern Western Australia is probably lower than was previously the case, and any that do occur are controlled as quickly as possible. Before the fire the vegetation, on deep acid sands, was dominated by dense shrubby Proteaceae, with depauperate shrub understorey and few annuals. After the fire, following a brief period a bare drifting soils, there was an explosion of previously rare or apparently absent herbaceous and small shrubby species. Along with *G. pycnostachyus* there was a proliferation of Poaceae, *Muehlenbeckia* spp., *Gyrostemon ditrigynus*, *Gyrostemon racemiger*, *Stackhousia* sp., *Tripterococcus brunonis*, *Alogyne hakeifolia*, *Commersonia crispa*, *Glischrocaryon* spp., *Trachymene anisocarpa*, *Cyphanthera microphylla*, *Solanum simile*, *Solanum capsiciforme* and

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Scaevola (Archer, pers. comm.). In this community *G. pycnostachyus* was very common, whereas before the fire it was apparently absent, and it remained absent from the unburned, dense Proteaceous shrubbery.

The species was subsequently also located on clay/sand loams over granite north-east of Mt Merivale. These plants were growing around a seasonally water-filled rock depression, partly on recently burned ground, partly in areas kept clear of shrubs by the shallowness of the soils and summer drying.

The collections show a fairly wide range of variability in vegetative characters, but are uniform in their flowers and fruits. All plants are in their first year, and all are fertile, They range in size from 11 to 25 cm tall, with arcuately ascending stems arising in a rosette from the crown of a taproot. The numbers of stems varies from 4–6 to about 30, with branching confined to the extreme base. All stems seem to eventually become fertile, with a typical *Gonocarpus*-type indeterminate spike of flowers borne in the axils of reduced leaf-like bracts. Leaf size is also very variable, even on a single plant, apparently depending very much on current growing conditions. As has been noted for other species of *Gonocarpus* (Orchard 1975), many flowers in this species are functionally female, with the petals reduced, and anthers only half their normal size and indehiscent. In this species both fully bisexual and functionally female flowers are found on the same plant, and sometimes even in the same spike. It may be that the abortion of the male parts is a function of growing conditions, with pollen only being produced early in the season when water is presumably more readily available. All collections examined from Mt Heywood were well developed and obviously approaching seasonal maturity.

G. pycnostachyus belongs to a small group of closely related species, including *G. confertifolius*, *G. ephemerus*, *G. nodulosus* and perhaps *G. urceolatus*. All except the last are annual or short-lived perennials of sandy soils in the southern half of Western Australia. They share a fairly coarse indumentum, relatively small ovate to narrowly ovate leaves, and a distinctly urceolate fruit. *G. confertifolius* differs from *G. pycnostachyus* (and from all other species in the group) by its relatively long narrow sepals. *G. ephemerus* is distinct in being the only Western Australian species in the group which lacks a fringe of long hairs on the sepals. *G. nodulosus* is distinguished from all other species in the group, and from all other *Gonocarpus* species, in lacking bracteoles around the flowers. *G. urceolatus* is somewhat anomalous in the group, in being confined to south-eastern Queensland. It has larger leaves than the other species, and like *G. ephemerus* is unusual in lacking the fringing hairs of the sepals, but its urceolate fruits seem to tie it to the group. Whereas the above are the most distinctive features of each species, they also differ in other less obvious characters, like bracteole shape, the size and density of hairs, degree of crowding of the leaves, and indumentum of the fruit.

The expanded description below incorporates the range of variability inherent in all known collections of *G. pycnostachyus*.

DESCRIPTION OF *GONOCARPUS PYCNOSTACHYUS*

Annual herbs 11–25 cm tall; *rootstock* a well-defined taproot, with numerous arcuate-ascending stems arising from its apex. *Stems* mainly unbranched, or sparingly so at the base only, green to reddish, unribbed, with a spreading indumentum of simple hyaline uniseriate 2–3-celled hairs, 0.25–0.8 mm long. *Leaves* opposite at base, soon becoming alternate, with petiole 1.5–3.0 mm long; *lamina* narrowly ovate to ovate, 8–18 mm long, 4–8 mm wide, sessile, midrib and veins weak to obscure, margin white and thickened, with 4–5(-8) short cuspidate teeth 0.5 mm long on each side, semi-appressed indumentum on upper and lower surfaces as for stems. *Inflorescence* an indeterminate spike, with lateral spikes developing freely in the axils of the upper leaves. *Bracts* green, lanceolate to broadly lanceolate, 2.0–5.5 mm long, 0.8–1.7 mm wide, entire, sessile, moderately pilose on abaxial surface with hairs as on the stems, less densely pilose on adaxial surface. *Bracteoles*

red-brown, trifid to multifid, 0.5–0.6 mm long, glabrous or with an occasional marginal hair. *Flowers* solitary in axils of bracts, 4-merous. *Sepals* 4, green, deltoid to narrowly ovate, 0.7–0.8 mm long, 0.4–0.5 mm wide, rather thick, rigidly erect, with a small basal callus, margin with a sparse to moderately dense fringe of hairs which are simple, unicellular and c. 0.1 mm long. *Petals* 4, deep red to green, 1.7–1.8(-2.2) mm long, 0.4–0.6 mm wide (keel to margin), strongly hooded and keeled, with a moderately dense spreading indumentum on dorsal surface, the hairs simple, 1–2-celled, 0.25 mm long. *Stamens* 8; filaments lengthening to 0.8 mm long; anthers deep red-purple, linear-oblong, 1.5–1.8 mm long, non-apiculate (sometimes abortive, yellow, 0.5–0.6 mm long, indehiscent). *Styles* 4, clavate, with bright reddish purple fimbriate stigmas. *Ovary* urceolate, on pedicel 0.4–0.6 mm long, dull reddish purple to silvery grey, neck 8-ribbed vertically, bulbous base with 2–3 horizontal rows of calluses, with a dense very short indumentum. *Fruit* 1-seeded, urceolate, silvery grey, 2.1 mm long (including sepals), 0.8–1.0 mm diameter, neck 8-ribbed, bulbous base 8-ribbed the ribs alternating with 8 vertical rows of 2–3 ± conical verrucosities, body of fruit covered with a dense indumentum up to 0.02 mm long (ribs opposite sepals sometimes glabrous, smooth, shiny); sepals persistent, dark greenish purple, erect to slightly spreading, with a marginal fringe of hairs, otherwise glabrous; pericarp membranous.

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NEW RECORDS OF PYRENOCARPOUS LICHENS FROM AUSTRALIA

P.M. McCarthy*

ABSTRACT

McCarthy, P.M. New records of pyrenocarpous lichens from Australia. ***Muelleria* 8(1): 31–36 (1993).** — *Laurera madreporiformis* (Eschw.) Riddle, *Pyrenula macularis* (Zahlbr.) R. C. Harris, *P. rubrostoma* R. C. Harris, *Staurothele fissa* (Taylor) Zwackh, *Strigula stigmatella* (Ach.) R. C. Harris and *Thelenella marginata* (Groenh.) Mayrh. are reported from Australia for the first time. New state/territorial records are provided for six other species.

INTRODUCTION

Whereas the Verrucariaceae and, to a lesser degree, Trichotheliaceae dominate the pyrenocarpous lichen flora of southern Australia, in tropical and subtropical latitudes, as elsewhere in the world, the Pyrenulaceae, Trichotheliaceae and Trypetheliaceae appear to be pre-eminent. However, almost all of the descriptions and reports from northern Australia are based solely on nineteenth century collections of often doubtful or poorly circumscribed entities. The present contribution documents several, mostly recent collections of Pyrenulaceae, Strigulaceae, Thelenellaceae, Trichotheliaceae, Trypetheliaceae and Verrucariaceae, mainly from northern New South Wales, Queensland and the Northern Territory.

THE SPECIES

1. **Clathroporina exocha** (Nyl.) Müll. Arg., *Bull. Herb. Boissier* 2, App. 1: 93 (1894). — *Verrucaria exocha* Nyl., *Flora* 52: 125 (1869).

Thallus corticolous, crustose, forming large, peeling, glossy, yellowish green patches. *Perithecia* immersed in inconspicuous, 0.5–1 mm diam., thalline verrucae; involucrellum vestigial; ostiole depressed. *Ascospores* 8 per ascus, muriform, colourless, fusiform-ellipsoid to fusiform, 60–100 × 20–30 µm, with a thick gelatinous sheath.

Apparently confined to the south-eastern Pacific rim, and already known from Queensland, *C. exocha* is reported for the first time from New South Wales.

Specimen Examined

New South Wales — Central Coast, 17 km SSE of Forster, Wallingat State Forest, Sugar Creek Flora Reserve, alt. *c.* 60 m, on bark in rainforest, 24 Apr. 1990, *P.M. McCarthy* (MEL).

2. **Laurera madreporiformis** (Eschw.) Riddle, in Howe, *Torreya* 16: 50 (1916). — *Trypethelium madreporiforme* Eschw., *Syst. Lich.*: 24 (1824).

Thallus crustose, corticolous, epiphloeodal, continuous, pale yellowish grey. *Perithecia* simple, 0.4–0.65 mm diam., solitary or in groups of up to 20 in rounded or irregular, dark olive-brown to black pseudostromata that contain orange, K+ purple-red crystals. *Ostiole* brown, in a plane, epruinose apical depression, 0.11–0.22 mm wide. *Centrum* 0.3–0.47 mm diam., inspersed with minute granular bodies. *Excipulum* brown-black, 40–60 µm thick near the apex, 17–22 µm thick at the base. *Pseudoparaphyses* branched-anastomosing, 1–1.5 µm thick. *Asci* 8-spored, clavate to clavate-cylindrical, 130–175 × 27–41 µm. *Ascospores* colourless, muriform-euseptate, with 10–15 transverse and 3–4 longitudinal divisions, ellipsoid to elongate-ellipsoid, 35–55 × 11–18 µm.

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Laurera madreporiformis is known in the Neotropics (Letrouit-Galinou 1957, Harris 1986) and India (Awasthi 1991). Its inclusion in recent Australian checklists (Filson 1983, 1986, 1988, McCarthy 1991) is most probably erroneous. It was not listed the earlier inventory of Weber & Wetmore (1972), nor have I been able to find any reports in the literature. The name *L. madreporiformis* var. *obscurior* (Church. Bab.) Zahlbr., which has appeared in all recent checklists, has, in fact, never been collected in Australia. Moreover, that taxon is not a *Laurera* but a bark-inhabiting fungus that is known only from New Zealand (Galloway 1985).

Specimens Examined

Northern Territory — Manton Dam, 51 km SE of Darwin, 12°50′S, 131°08′E, alt. 70 m, on fallen tree-branch, in forest beside stream below dam, 26 Dec. 1984, *H. Streimann 8743* (CBG 9011111); Wangi Road, Walker Creek, 68 km SSW of Darwin, 13°05′S, 130°43′E, alt. 95 m, on shrub-branch in *Eucalyptus* woodland on moderate slope, 1 Jan. 1985, *H. Streimann 8801* (CBG 9011112, part).

3. **Pyrenula astroidea** (Fée) R. C. Harris, *Mem. New York Bot. Gard.* 49: 87 (1989). — *Parmentaria astroidea* Fée, *Essai Crypt.*: 70 (1824).

Thallus epiphloedal, corticate, smooth, pale grey-green to grey-brown, UV-. *Perithecia* 0.4–0.8 mm diam., fused at the ostiole in groups of 2–5 and enclosed in a black, semi-immersed, 1–1.8 mm diam. pseudostromatic shell. *Ascospores* pale brown, submuriform-distoseptate, elongate-ellipsoid, 29–38 × 12–17 µm.

It has been suggested by Harris (1989) that this comparatively well-known lichen is probably pantropical in dry lowland regions. Its known Australian distribution, previously limited to south-eastern Queensland, is expanded here to include eastern and north-eastern New South Wales.

Specimens Examined

New South Wales — SE of Armidale, River Styx State Forest, Big Hill, between Jeogla and Georges Creek, on bark in wet sclerophyll forest, 25 Oct. 1967, *W. A. Weber & D. McVean* (CBG 9011113); Blue Mountains, Mount Wilson, below Gwynne Rocks look-out, on *Atherosperma moschatum* in residual rainforest, 3 Apr. 1968, *W. A. Weber* (COLO L-47364, CBG 9200943).

4. **Pyrenula macularis** (Zahlbr.) R. C. Harris, *Mem. New York Bot. Gard.* 49: 94 (1989). — *Anthracothecium maculare* Zahlbr., *Mycologia* 22: 70 (1930).

Thallus pale yellowish green, white-maculate, smooth, continuous, UV−. *Perithecia* very numerous, almost entirely immersed, 0.28–0.42 mm diam. *Ascospores* uniseriate in elongate-cylindrical asci, ellipsoid to elongate-ellipsoid, muriform, with 6–8 rows of 3–6 rounded locules, 35–46.5 × 14.5–18 µm.

While in most *Pyrenulae*, post-mature ascospores darken and shrivel, in *P. macularis* and a few others they retain their shape; however, the locules lose definition and are replaced by globules of a dark red-brown oily substance. This lichen is known from Central America, the Caribbean region, Africa and Madagascar (Harris 1989).

Specimen Examined

Northern Territory — Lee Point, 16 km NNE of Darwin, 12°20′S, 130°54′E, on treelet stem in low coastal scrub, alt. 3 m, 2 Jan. 1985, *H. Streimann 8825* (CBG 9007586).

5. **Pyrenula ochraceoflava** (Nyl.) R. C. Harris, *Mem. New York Bot. Gard.* 49: 96 (1989). — *Verrucaria ochraceoflava* Nyl., *Expos. syn. Pyren.*: 50 (1858). — *Anthracothecium ochrotropum* (Nyl.) Zahlbr., *Cat. lich. univ.* 1: 468 (1922).

Thallus crustose, effuse, yellowish-white, K+ purple. *Perithecia* 0.24–0.4 mm diam., partly overgrown by the thallus. *Ascospores* biseriate in the asci, submuriform-distoseptate, colourless to pale brown, 11–19 × 8.5–12 µm.

This pantropical and most distinctive lichen, already known (as *Anthracothecium ochrotropum*) from Queensland (McCarthy 1991), is reported for the first time from the Northern Territory.

Specimens Examined

Northern Territory — Grant Is., fresh-water billabong, behind beach, on bark in *Rhizophora-Melaleuca* complex, 9 Jul. 1975, *D. Grace* (MEL); Arnhem Land, King. R., 24 km upstream from Maningrida, on bark, 2 Aug. 1975, *D. Grace* (MEL).

6. **Pyrenula ravenelii** (Tuck.) R. C. Harris, *Mem. New York Bot. Gard.* 49: 99 (1989). — *Parmentaria ravenelii* (Tuck.) Müll. Arg., *Flora* 68: 250 (1885).

Pyrenula ravenelii may be distinguished from the closely related *P. astroidea* mainly by its larger, muriform-distoseptate ascospores (Harris 1989). First described and most commonly known from the south-eastern United States (Harris 1989), *P. ravenelii* (as *Parmentaria ravenelii*) was reported from Warburton, Victoria by Müller (1893). The Tasmanian specimen listed here has ascospores of 61–80 × 21–30 µm and was formerly attributed to the quite different tropical lichen *Parmentaria gregalis* (Knight) Müll. Arg. (McCarthy 1991).

Specimen Examined

Tasmania — Hobart Rivulet, on bark, Jan. 1901, *F.R.M. Wilson* (MEL 5819).

7. **Pyrenula rubrostoma** R. C. Harris, in Tucker & Harris, *Bryologist* 83: 16 (1980).

Thallus thin, smooth, corticate, greyish brown. *Perithecia* semi-immersed, conical, 0.46–0.66 mm diam., with a spreading and uniformly brown-black involucrellum, K−. *Ascospores* 4-celled, pale brown, elongate-ellipsoid, irregularly biseriate in the asci, with an additional endospore layer around the lumina, 16–23.5 × 7.5–12.5 µm.

Harris (1989, in Tucker & Harris 1980) observed that *P. rubrostoma* possesses two especially distinctive characters, *viz.* a bright red, K+ blue ostiolar area and a second endospore layer within the 17–19 × 7.5–9 µm ascospores. However, he also noted an absence of red pigment in some specimens, in which case 'the spores are sufficient for determination' (Tucker & Harris 1980).

This is the first Australian record of a lichen previously known only from the southern American states of Louisiana and Florida.

Specimen Examined

Queensland — 5 miles W of Gordonvale, on bark in lowland rainforest, 17 Apr. 1968, *W. A. Weber* (COLO L-48205).

8. **Staurothele fissa** (Taylor) Zwackh, *Flora* 45: 552 (1862). — *Verrucaria fissa* Taylor, *Fl. hibern.* 2: 95 (1836).

Thallus crustose, epilithic, rimose to areolate, dark olive brown to brown-black, 80–140 µm thick. *Perithecia* 0.24–0.38 mm diam., semi-immersed to almost entirely immersed in prominent thalline verrucae. *Hymenial algae* globose-cuboid. *Ascospores* 2 per ascus, muriform-euseptate, hyaline to pale brown, 32–50 × 14–20 µm.

Staurothele fissa is a rather common lichen on aquatic and semi-aquatic siliceous rocks in cool-temperate, alpine and boreal regions of the Northern Hemisphere (Clauzade & Roux 1985, Kopachevskaya *et al.* 1977, Thomson 1991); it has also been found in New Zealand (Galloway 1985). Although *Staurothele* has not been reported from Australia, fragmentary specimens of an indeterminate calcicolous species are known from Kalbarri National Park in Western Australia (specimens in MEL).

The Tasmanian specimens of *S. fissa* were found on exposed surfaces, between 10 and 50 cm above water-level, together with *Hymenelia lacustris*, *Ver-*

rucaria aff. *praetermissa* and *Verrucaria* aff. *submargacea*. In view of its distribution in the Northern Hemisphere, it is, I believe, noteworthy that this lichen was not seen in any of the 40–50 creeks visited by me in central and eastern Victoria and coastal New South Wales.

Specimen Examined

Tasmania — Tyenna R., *c.* 2 km E of Westerway, by Hobart-Maydena road, semi-aquatic on large dolcrite boulders, 26 Apr. 1992, *P. M. McCarthy* (MEL, HO).

9. **Strigula stigmatella** (Ach.) R.C. Harris, in Hawksworth *et al., Lichenologist* 12: 107 (1980). — *Porina faginea* (Schaerer) Arnold, *Flora* 68: 166 (1885).

Thallus crustose, subepilithic to epilithic, pale greenish grey, smooth, glossy, continuous to sparingly rimose, 15–30(-80) µm thick. *Perithecia* 1/3-immersed to semi-immersed. *Perithecial apex* flattened. *Ostiole* pale brown. *Involucrellum* (0.34-)0.47(-0.64) mm diam., penetrating to excipulum-base level, uniformly dull olive-black in thin section or with only the outermost 25–30 µm olive-black and the inner parts pale to medium brown and inspersed with algal cells, 60–90 µm thick. *Excipulum* colourless at the base, colourless to brown at the sides, dark brown towards the apex. *Paraphyses* simple to very sparingly branched, not anastomosing. *Asci* fissitunicate, 90–110 × 13–16 µm; ocular chamber becoming tuberculate, *c.* 3 × 1 µm . *Ascospores* colourless, 7-septate, fusiform, 23–33 × 5.5–7.5 µm. *Conidiomata* of two types; 1) 100–160 µm diam., dark brown above, colourless below, with 5–7-septate, 15–21 × 3–4.5 µm bacilliform macroconidia growing vertically from the apices of short, unbranched conidiophores; 2) 60–80(-100) µm diam., with straight, 2–3 × 0.7 µm microconidia.

Until comparatively recently, *Strigula* was considered to be exclusively foliicolous (Santesson 1952). However, once the possession of a subcuticular thallus, an important generic characteristic of the foliicolous taxa (though of little meaning when applied to species on other substrata), was set aside, a number of hitherto problematical corticolous and bryophilous pyrenocarps were referrable to *Strigula* (Harris 1975). Five obligately and facultatively saxicolous taxa are currently known from Europe and the Americas.

Strigula stigmatella is almost exclusively corticolous and bryophilous. It has been reported from northern, central and eastern Europe and from northern U.S.A. Apart from the Australian collections described here, I have seen only one other saxicolous specimen [Germany, Oberbayern, bei Tolz, an umherliegenden Sandsteinen im Walde an der Westseite des Blombergs, 19 Sep. 1880, *F.C.G. Arnold* 863 (G)].

Specimens Examined

New South Wales — Newcastle region, 3 km SE of Stroud Road, 1 km S of Stroud Mt, creek beside Ducks Hill Road, on deeply shaded semi-aquatic rhyolite, 22 Apr. 1990, *P.M. McCarthy 363* (MEL 1055381); Chichester State Forest, 19 km W of Stratford, Karuah Valley Road, off Wards River-Berrico Trig Road, Karuah R., on shaded semi-aquatic slate, 9 Feb. 1991, *P.M. McCarthy 519* (MEL 1055306).

10. **Thelenella marginata** (Groenh.) Mayrh., *Bibliotheca lichenol.* 26: 48 (1987). — *Microglaena marginata* Groenh., *Reinwardtia* 2: 391 (1954).

Thallus determinate, pale yellowish green, rimose to areolate. *Perithecia* immersed in hemispherical, 0.26–0.4 mm diam. thalline verrucae. *Ascospores* hyaline, 6–8 per ascus, muriform, with 10–14 transverse and 3–4 longitudinal divisions, 30–43.5 × 12–18 µm.

This is the second report of a lichen that was previously known from eastern Java (Mayrhofer 1987).

Specimen Examined

Northern Territory — Mt Brockman complex, 15 km SSE of Jabiru airfield, 12°48'S, 132°56', alt. 230 m, on shaded sandstone rock face, in *Allosyncarpia*-dominated vegetation amongst deeply dissected outcrops, 20 Apr. 1989, *H. Streimann 44283* (B 79664, CBG 8914774).

11. **Trypethelium eluteriae** Sprengel, *Anleitung Kenntn. Gewachse* 3: 351 (1804).

Thallus continuous to rimose, smooth to uneven, pale brown. *Pseudostromata* containing 5–15 ascomata embedded in a powdery orange material, 0.8–2 mm wide. *Hamathecium* of branched-anastomosing pseudoparaphyses. *Ascospores* colourless, elongate-fusiform, 9–13-septate, 34–48 × 8–11 µm.

A common lowland pantropical species, *T. eluteriae* is known from the Caribbean region, South America, India and Sri Lanka, China and Australia (Queensland). The following is the first report from the Northern Territory.

SPECIMEN EXAMINED

Northern Territory — Wangi Road, Walker Creek, 68 km SSW of Darwin, 13°05′S, 130°43′E, alt. 95 m, on shrub branch in *Eucalyptus* woodland on moderate slope, 1 Jan. 1985, *H. Streimann 8801* (CBG 9011112; part).

12. **Trypethelium tropicum** (Ach.) Müll. Arg., *Bot. Jahrb.* 6: 393 (1885). — *Verrucaria tropica* Ach., *Lich. Univ.*: 278 (1810).

Thallus smooth to farinose, continuous, grey-green to yellowish grey. *Ascomata* superficial, not aggregated in pseudostromata, black, 0.4–0.55 mm diam. *Ascospores* colourless, fusiform, 3-septate, 16–27 × 6–8 µm.

Trypethelium tropicum and its many synonyms (Harris 1986) have been reported from south-eastern U.S.A., Central and South America, tropical Africa, the Indian sub-continent, Indonesia, The Philippines and Queensland. The following are the first records from the Northern Territory.

SPECIMENS EXAMINED

Northern Territory — Wangi Road, Walker Creek, 68 km SSW of Darwin, 13°05′S, 130°43′E, alt. 95 m, on shrub branch in *Eucalyptus* woodland on moderate slope, 1 Jan. 1985, *H. Streimann 8801* (CBG 9011112, part); 13 km SSE of Adelaide River township, Robin Falls, 13°21′S, 131°08′E, alt. 120 m, on bark near base of treelet, in dense vegetation on creek flats surrounded by *Eucalyptus* savannah, 14 Apr. 1989, *H. Streimann 42120* (CBG 8914609).

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UTRICULARIA BEAUGLEHOLEI (LENTIBULARIACEAE: SUBGENUS UTRICULARIA: SECTION PLEIOCHASIA), A NEW SPECIES FROM SOUTH-EASTERN AUSTRALIA

ROBERT J. GASSIN*

ABSTRACT

Gassin, Robert J. *Utricularia beaugleholei* (Lentibulariaceae: subgenus Utricularia: section Pleiochasia), a new species from South-eastern Australia. ***Muelleria* 8(1): 37–42 (1993).** — *Utricularia beaugleholei* R.J. Gassin *sp. nov.* is described as new, its distribution and habitat are discussed and differences with the related *Utricularia dichotoma* Labill. are highlighted.

INTRODUCTION

The first known collection of *Utricularia beaugleholei* was made in 1852 by *F. Mueller (MEL 89973)* in Brighton, now a suburb of Melbourne. Several more collections have been made since, especially during the last two decades by A.C. Beauglehole, who like previous collectors wrongly recognised them as *U. dichotoma* Labill. However Beauglehole was aware of there being two similar but distinct species and many of his numerous collections of *U. dichotoma* are also wrongly labelled *U. uniflora* R. Br. Taylor (1989) referring to *U. dichotoma* noted that 'very large flowers sometimes occur in the eastern states and these are not always associated with large or tall plants'. It seems likely that he was referring to *U. beaugleholei*. Interestingly, Taylor on examining collections of MEL for *Flora of Australia* recognised Beauglehole's mistake in confusing *U. dichotoma* for *U. uniflora* but did not recognise his other mistake.

On a recent fieldtrip, I was fortunate to find and examine live material of both *U. dichotoma* and *U. beaugleholei*. This revealed several taxonomically significant differences. This opportunity is taken of describing *U. beaugleholei* and of highlighting differences with *U. dichotoma*.

TAXONOMY

Utricularia beaugleholei R.J. Gassin *sp. nov.*

> *Utricularia dichotoma* Labill. affinis, foliis lanceolatis anguste valde vel linearis anguste, ad 44 mm longis, 1.6 mm latis, apice acuto valde; appendiculis dorsalis laquei longioris laqueo saepe; marginibus supero partis labello supero corollae reflexis, labello infero corollae 4–11 elevatis leviter cristis luteis radiatim, et palato glabro centro marginalibus lateralibus pubescentibus differt.

HOLOTYPUS: Victoria: 8 km NNE of Strathmerton near site of Mywee railway station in the Murray Valley, 30 Sep. 1978, *T.B. Muir 5322* (MEL).

Small, probably perennial terrestrial *herb. Rhizoids* numerous, capillary, simple, c. 2 cm long, tapering from 0.5 mm to 0.1 mm thick. *Stolons* few, capillary branched up to several centimetres long, the internodes less than 2 centimetres. *Leaves* 1-nerved, a few rosulate at the peduncle base, others in pairs at the stolon nodes, petiolate, lamina very narrowly lanceolate to narrowly linear, up to 44 mm long and 1.6 mm wide, tapering to a very acute apex. *Traps* few at the peduncle base, others in pairs at the stolon nodes, ovoid or globose, 1–4 mm long, stalk 10 mm or less, mouth lateral with a subulate simple dorsal appendage often longer than the trap, a pair of well developed, deeply fimbriate lateral appendages up to 2.5 mm long, and a pair of deeply fimbriate ventral appendages, usually poorly developed or absent proximally (near the stalk) and widest distally (near the

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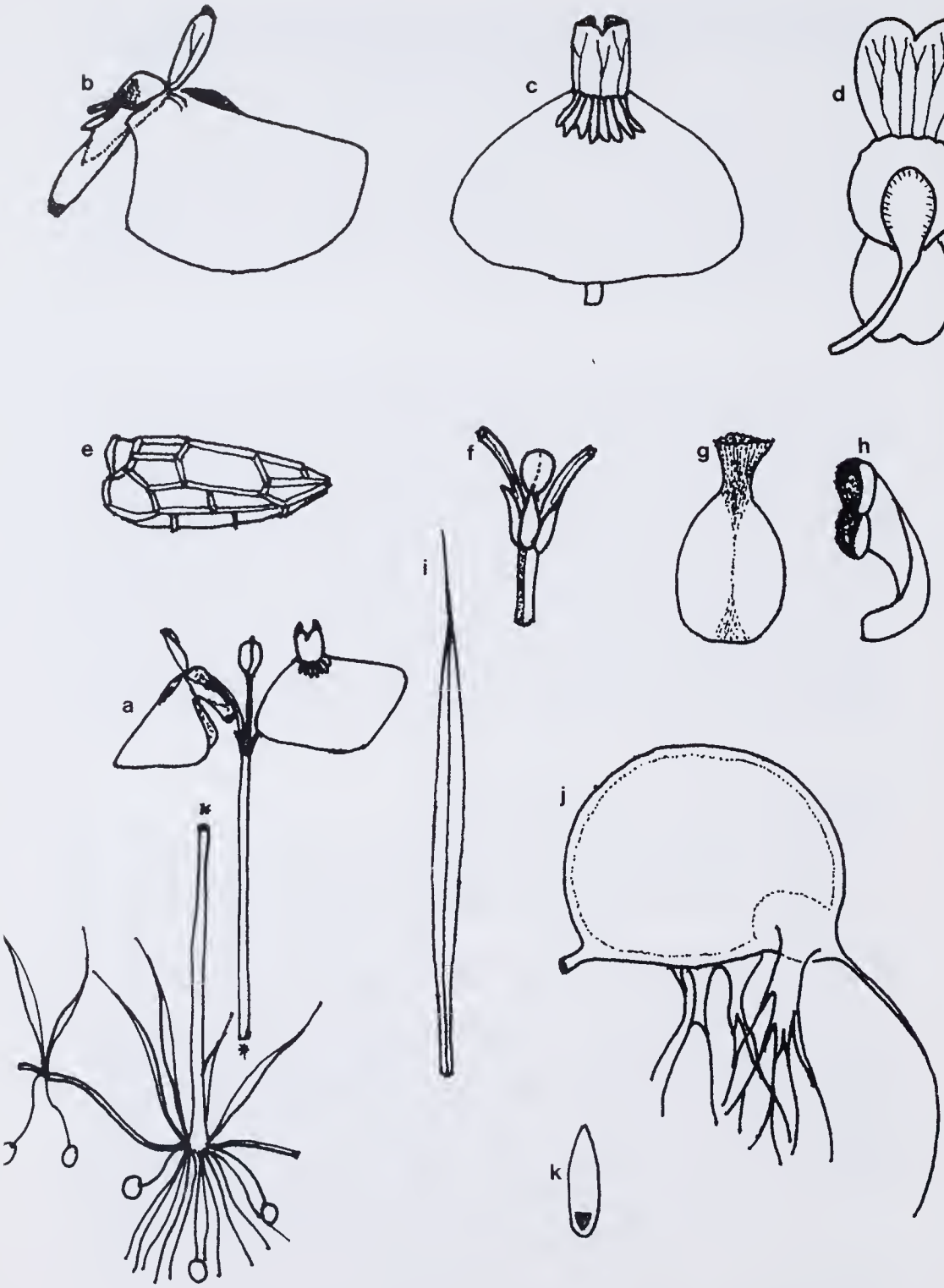

Fig. 1. *Utricularia beaugleholei*. a — habit ×1. b — flower, lateral view ×2.5. c — flower, anterior view ×2.5. d - calyx and upper corolla lobe ×5. e — seed ×44. f — bracts and bracteoles in situ ×3. g — pistil ×14. h — stamen × 14. i — leaf ×3. j — trap, lateral view ×14. k — bract ×6. a,d–k drawn from *R.J. Gassin 23* (MEL); b,c drawn from *S.J. Forbes 1875 & N.H. Scarlett* (MEL).

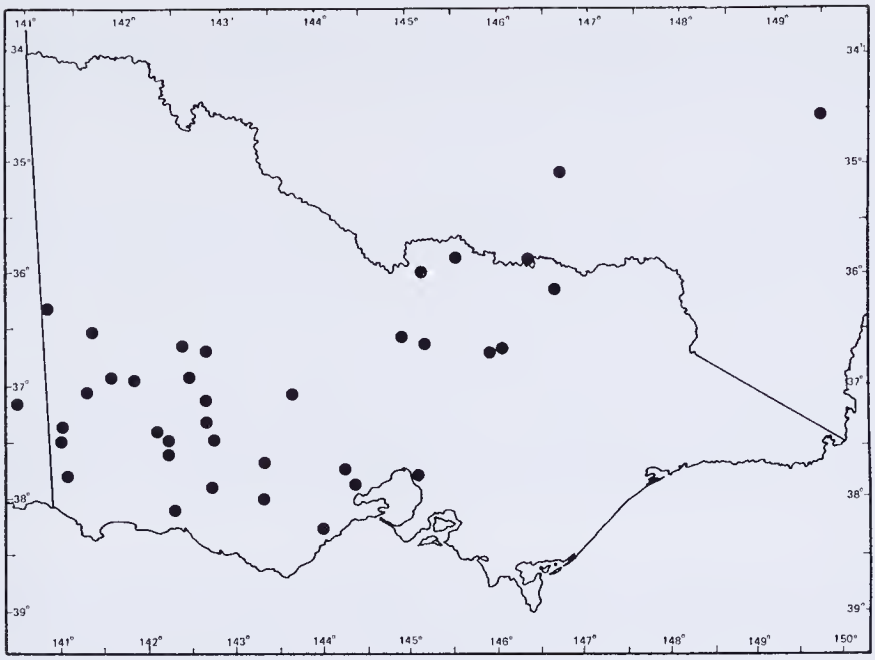

Fig. 2. Known distribution of *Utricularia beaugleholei*.

mouth), up to 2 mm long but sometimes absent. *Inflorescence* erect, solitary or several arising together or in succession, 4–35 cm long, peduncles terete, glabrous 0.8–2.0 mm thick. *Scales* absent. *Bracts and bracteoles* similar, basifixed, 2.0–3.5 mm long, 0.8–1.6 mm wide, base either absent or slightly gibbous, the superior part oblong or ovate, the apex acute. *Flowers* single, in opposite pairs or whorls of 3, terminal or at 2 or more nodes along the raceme axis; pedicles erect, filiform, distinctly dorsiventrally compressed, 0.25–1.5 cm long. *Calyx* lobes unequal, upper lobe circular or broadly ovate 2.5–4.5 mm long, lower lobe ovate or broadly ovate with apex emarginate to distinctly bifid 2.5–4.5 mm long, margins of both lobes wavy. *Corolla* dark violet with yellow markings at the base of the lower lip; upper lip erect with conspicuous vertical darker violet nerves, constricted near the middle, the superior part obcordate or broadly obovate with the apex emarginate, the lateral margin reflexed at 90° or more, 3.5–6.0 mm long, 3.0–6.0 mm wide, the lower part broadly semicircular and heavily pubescent on the abaxial surface, lower lip limb broadly hachet-shaped to reniform, 0.8–1.5 cm long, 1.4–2.7 cm wide, the base with 4–11 slightly raised radiating yellow ridges, the apex rounded or shallowly 3-lobed; palate glabrous centrally lateral margins pubescent; spur elliptic in cross section with apex distinctly bilobed, shorter than and broadly divergent from the lower lip. *Filaments* curved, 2 mm long, the anther theca distinct. *Ovary* superior, ovoid, style short. *Capsule* globose, 3–5 mm in diameter, the wall membranous, dehiscing by a single longitudinal, ventral, marginally thickened slit. *Seeds* narrowly obovoid *c.* 0.8 mm long. (Fig. 1)

Distribution (Fig. 2)

Scattered throughout south west Victoria from the South Australia border to Port Phillip Bay, south of latitude 36°20′S. Also from the Murray Valley, north-east Victoria and the adjacent part of New South Wales between latitudes 35°S and

35°50′S and longitudes 144°50′E and 146°50′E. A single collection by *F. Mueller (MEL 89873)* from Goulburn in New South Wales marks the most northerly and easterly limits of its range. It has also been recorded from the Mary Seymour Conservation Park (37°10′S, 140°47′E) in the south-eastern corner of South Australia (Allen Lowrie pers. comm.)

Habitat

Utricularia beaugleholei is found in wet sandy and clayey soils, often on the margin of swamps but also in roadside drains and on seasonally wet flood plains, usually in open grassland.

It has been collected in flower between September and March.

Representative Specimens (total number examined 41)

Victoria — 4.25 miles WSW of Dergholm PO, 14 Dec. 1971, *A.C. Beaugleholе 38062* (A, BRI, CANB, DNA, MEL, NSM); Little Desert, 15 km W of Broughton Waterhole, 9 Nov. 1979, *A.C. Beaugleholе 66348* (BA, CBG, MEL, NSM); Coolinda 24 km WNW of Stawell PO, 22 Oct. 1979, *A.C. Beaugleholе 65113* (MEL); Deep Lead Flora & Fauna Reserve, 7 Oct. 1981, *A.C. Beaugleholе 96124 & W. McPhee* (MEL); 10 km NNW of Anglesea PO, 16 Jan. 1979, *A.C. Beaugleholе 63333* (MEL); 12.5 miles WSW of Casterton PO 21 Dec. 1971, *A.C. Beaugleholе 238112* (MEL).

Discussion

Although very variable in size, the morphology of *Utricularia beaugleholei* is relatively constant. This species has previously been confused with *U. dichotoma* and indeed many of its characteristics are shared by some populations of the latter species. However, the combination of characteristics outlined above are unique to *U. beaugleholei*. Futhermore a number of mixed collections of both species exist [*W.T. Whan (MEL 89970), F. Mueller (MEL 89973), St Eloy D'Alton 16 (MEL)*] suggesting mixed populations occur in nature. In these, the two species remain readily differentiated.

Some of the differentiating characteristics between the two species are discussed below.

The most striking differences are to be found in the corolla lips. Whereas in *U. dichotoma*, the upper lip is flat and only protudes a small distance above the lower lip palate, in *U. beaugleholei* it is larger, reflexed at 90° or more, and protudes several mm above the palate. Its emarginate or bilobed apex is also more pronounced and a more constant characteristic than in *U. dichotoma.*

The lower corolla lip of *U. beaugleholei* differs from that of *U. dichotoma* in several respects. The palate of the former species is glabrous apart from its lateral margins whereas in the latter it is pubescent. The distribution of the ridges arising

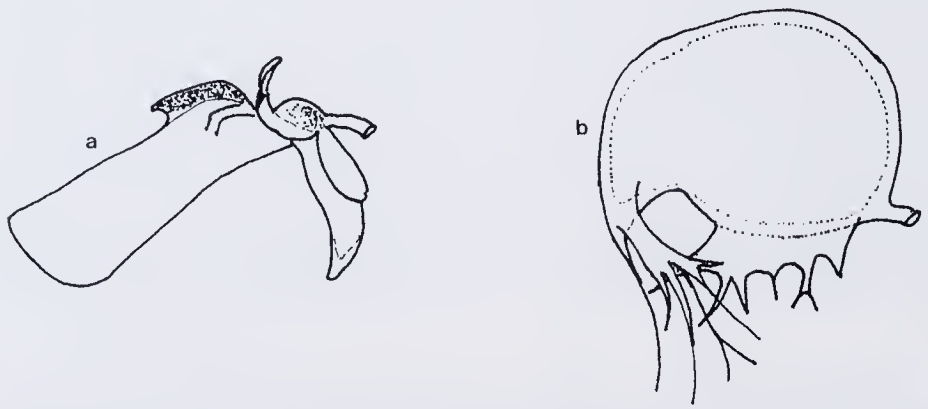

Fig. 3. *Utricularia dichotoma*. a — flower, lateral view ×2.0. b — trap, lateral view ×11. a drawn from *T.B. Muir 4792* (MEL); b drawn from *T.B. Muir 4813* (MEL).

from the anterior aspect of the palate provides the easiest means of differentiating between the two species. In *U. dichotoma* three sets of ridges arise from the palate, these are markedly elevated above the remainder of the limb (Fig. 3a). A central pair protrudes forward over the centre of the limb, and 2 smaller lateral sets each comprising two or more ridges are at approximately 45° to the central pair. A further small ridge sometimes arises between the apices of the 2 central ridges. The central 2 (or 3) ridges are yellow (rarely brown) and the lateral ridges either yellow or purple, there being a maximum of 7 yellow stripes. In *U. beaugleholei* 4 to 10 ridges arise from the palate, these are only slightly raised above the remainder of the limb. In contrast to *U. dichotoma*, the ridges are equidistant from each other and diverge slightly as they extend from the palate. As in *U. dichotoma* a further small ridge is often present between the 2 central ridges. In this species, the ridges are always yellow giving a maximum of 11 yellow stripes.

In both species, the flowers can be terminal or clustered at 2, 3 or rarely more nodes. Whereas in *U. beaugleholei* flowers in the lower and subsequent nodes are often in whorls of 3, this arrangement is very rare in *U. dichotoma*. Examination of specimens from over 100 collections of this species has revealed very few specimens with the lower clusters of flowers in a whorl of 3 and none with that arrangement in subsequent nodes, the flowers being either single or in opposite pairs.

In *U. beaugleholei*, the bracts are always basifixed sometimes with a slightly gibbous base whereas in *U. dichotoma* they are more commonly basisolute. However, when basifixed they are indistinguishable from those of *U. beaugleholei*.

Whereas the leaf shape of *U. dichotoma* is very variable, ranging from narrowly linear to broadly elliptic and the apex rounded to acute, the leaf shape of *U. beaugleholei* varies only very slightly being either very narrowly lanceolate or narrowly linear always tapering to a very acute apex. Observations by myself and others have revealed that the linear leaf-shape of some populations of *U. dichotoma* is a result of growing in shallow water, the leaf becoming broader and shorter when the same plants are grown in drier soils. Unfortunately, similar observations have not been made for *U. beaugleholei* but the fact that the leaf shape of collected specimens shows so little variation would suggest that growing conditions are not crucial in determining leaf shape although they could account for variation in leaf size.

The morphology of the trap appendages is also helpful in differentiating the two species. The dorsal appendage of the *U. beaugleholei* trap is usually long, often longer than the trap, although this condition is uncommon in *U. dichotoma*, it does occur. The lateral appendages of the *U. beaugleholei* trap are much longer and more deeply fimbriate than those of *U. dichotoma*. However, the most obvious difference is in the ventral appendages. In *U. dichotoma*, (Fig. 3b) when present these are wide, marginally entire or shortly fimbriate, and of constant width throughout their length, whereas in *U. beaugleholei* when present they are usually more deeply fimbriate and usually widest distally and sometimes very poorly developed or absent proximally.

ACKNOWLEDGEMENTS

I would like to thank Jim Ross and David Albrecht of the National Herbarium of Victoria (MEL) for their invaluable assistance in the preparation of this paper. Neville Walsh also of MEL provided the Latin diagnosis. Allen Lowrie from Western Australia is thanked for sharing his knowledge of Australian carnivorous plants and for his advice on preparation of the illustrations. The Director of the Kew Herbarium kindly sent on loan several type specimens. Thanks are also due to Mrs Danielle Gassin, my mother, for typing the original manuscript.

I am indebted to Peter Taylor previously of the Royal Botanic Gardens, Kew, whose outstanding work on *Utricularia* has not only stimulated my interest in the

taxonomy of the genus but has also made it possible for me to tackle this most complex and interesting group of plants.

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Manuscript submitted 25 June 1992.

BACIDIA ALBIDOPLUMBEA (LICHENISED ASCOMYCOTINA) AND ITS TAXONOMIC SYNONYMS IN TASMANIA

GINTARAS KANTVILAS*

ABSTRACT

Kantvilas, Gintaras. *Bacidia albidoplumbea* (lichenised Ascomycotina) and its taxonomic synomyms. ***Muelleria* 8(1): 43–46 (1993).** — *Bacidia albidoplumbea* (J.D. Hook. & Taylor) Hellbom, previously considered endemic to New Zealand, is recorded from Tasmania, and additional descriptive data and illustrations are provided. The names of three Tasmanian taxa, *B. melasemoides* (Jatta) Zahlbr., *B. otagensis* var. *tasmanica* (Jatta) Zahlbr., and *B. weymouthii* (Shirley) Zahlbr., are reduced to synonymy.

INTRODUCTION

Recent studies of Tasmanian lichens and relevant Australasian type specimens have revealed that three taxa of *Bacidia* are conspecific with *B. albidoplumbea*, a corticolous lichen from New Zealand. First described (as a *Lecidea*) by Hooker & Taylor (1847), this species was later redescribed from New Zealand by Knight, Nylander, Stirton and Zahlbruckner, to the extent that Galloway (1985) recognised seven taxonomic synonyms in the New Zealand flora alone. The present paper clarifies the nomenclature of the species in Tasmania, and provides additional descriptive data.

TAXONOMY

Bacidia albidoplumbea (J.D. Hook. & Taylor) Hellbom, *Bihang K. Sv. Vet.-Akad. Handl.* 21(3) 13: 99 (1896). — *Lecidea albidoplumbea* J.D. *Hook.* & Taylor, *Hook. Lond. J. Bot.* 3: 638 (1844); TYPE: 'New Zealand' sine loco [LECTOTYPE *fide* Galloway (1985): BM!].

Bacidia melasemoides (Jatta) Zahlbr., *Catal. Lich. Univ.* 4: 252 (1927). — *Raphiospora melasemoides* ['melasenoides'] Jatta, *Boll. Soc. bot. ital.* 8: 258 (1911); TYPE: 'Tasmania meridionalis, ad arbores in monte Wellington, alt. 500 p [ft],' *W.A. Weymouth* (HOLOTYPE: NAP!).

Bacidia otagensis (Nyl.) Hellbom var. *tasmanica* (Jatta) Zahlbr., *Catal. Lich. Univ.* 4: 253 (1927). — *Raphiospora otagensis* var. *tasmanica* Jatta, *Boll. Soc. bot. ital.* 8: 258 (1911); TYPE: 'Tasmania, ad truncum Sassafragis prope Geeveston, alt. 1100 p [ft]', *W.A. Weymouth* [LECTOTYPE (selected here): NAP!]; 'Tasmania, ad arbores in monte Wellington, alt. 500 p [ft]', *W.A. Weymouth* (SYNTYPE: NAP!).

Bacidia weymouthii (Shirley) Zahlbr., *Catal. Lich. Univ.* 4: 248 (1927). — *Patellaria weymouthii* Shirley, *Pap. Proc. R. Soc. Tasm.* (1893): 217 (1894); TYPE: Tasmania, St. Crispins, Mt Wellington, *W.A. Weymouth* [LECTOTYPE, *fide* Kantvilas (1988a): BRI!]; Tasmania, Mt Wellington, St. Crispins, on bark of tree, 10 Mar. 1891, *W.A. Weymouth 112* (SYNTYPE: MEL!).

[*Bacidia millegrana auct. non* (Taylor) Zahlbr.: Bratt & Cashin, *Pap. Proc. R. Soc. Tasm.* 110: 144 (1976).]

For synonymy in New Zealand see Galloway (1985).

This species is characterised by a thin, whitish grey to dingy glaucous grey, smooth, crustose thallus, black glossy, lecideine apothecia to *c.* 1.5 mm diameter, with a persistent flexuose margin, an unpigmented hymenium inspersed with numerous oil droplets up to *c.* 4–6 μm diameter, and fusiform-acicular, usually bent, indistinctly 3–7 septate ascospores, 35–65 × 3.5–6(–7) μm.

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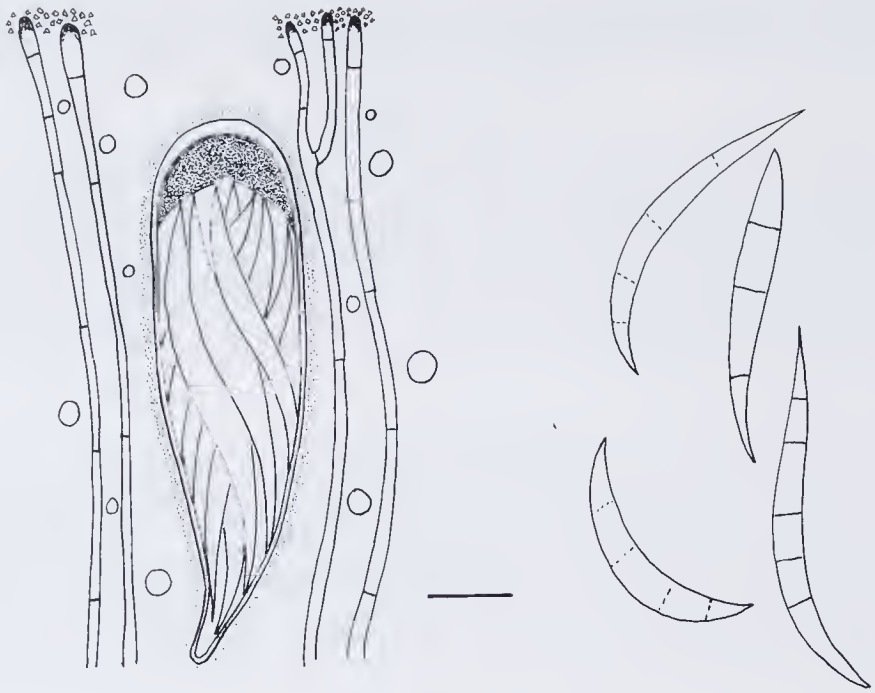

Fig. 1. Portion of hymenium and spores of *Bacidia albidoplumbea* (amyloid portions of ascus stippled). Scale bar = 10 μm.

More complete descriptions are provided by Kantvilas & James (1991) (as *B. weymouthii*) and by Galloway (1985). Details of asci, paraphyses and spores are illustrated in Figure 1.

Bacidia albidoplumbea has no confusing species in the Tasmanian lichen flora. The genus *Bacidia* includes several additional species, including several currently undetermined, possibly new taxa, but all differ by the pigmentation and morphology of their apothecia, or by their ascospores.

Remarks

Bacidia albidoplumbea. The lectotype consists of two pieces of bark. The thallus is very poorly developed, thin and atypically dull grey. Apothecia are few, mostly immature and in poor condition, but sufficient fertile asci were located for anatomical examination. No chemical substances, apart from trace unknowns, were detected by thin layer chromatography (t.l.c.). Hellbom (1896) attributes the combination in *Bacidia* to Charles Knight, but this is illegitimate and appears to be based solely on his acceptance of Knight's species, *B. subscripta*, as a synonym of *B. albidoplumbea*.

Bacidia melasemoides. The type consists of a small fragment of bark bearing abundant, typical well-developed apothecia. No chemical constituents were detected by t.l.c. The epithet 'melasenoides' which appears in the published description (Jatta 1911) is clearly an orthographic error: 'melasemoides' is hand-written on the specimen label and, furthermore, the name is derived from *Bacidia melasema* Knight, another synonym of *B. albidoplumbea*.

Bacidia otagensis var. **tasmanica**. Both syntypes consist of tiny fragments of bark bearing well-developed, abundantly fertile thalli. In his original description, Jatta (1911) cites dimensions of 80–100 × 2–3 μm, but a re-examination of his

material revealed only spores in the range of 40–45 × 3–4 µm, compatible with those typical of *B. albidoplumbea*. Of the two syntypes, the specimen from Mt Wellington has more abundant, well-developed apothecia and is here selected as the lectotype. No chemical constituents were detected in either specimen by t.l.c.

Bacidia weymouthii. Two of the three syntypes orginally cited by Shirley (1894) have been located. Both represent large, abundantly fertile collections and are typical of the species in Tasmania, i.e. with a conspicuous, pale whitish grey thallus. A trace of atranorin was detected by t.l.c. in the lectotype collection. Typification of this taxon is discussed by Kantvilas (1988a).

Bacidia millegrana. This name has been misapplied to several early Tasmanian collections of *B. albidoplumbea* (see Bratt & Cashin 1976). *B. millegrana* is a distinct species with brownish apothecia and spores having up to 13 septa (Taylor 1847, Nylander 1888). First described from Argentina, it has been recorded from New Zealand (Nylander 1888) and mainland Australia (McCarthy 1991). To date there are no substantiated records from Tasmania.

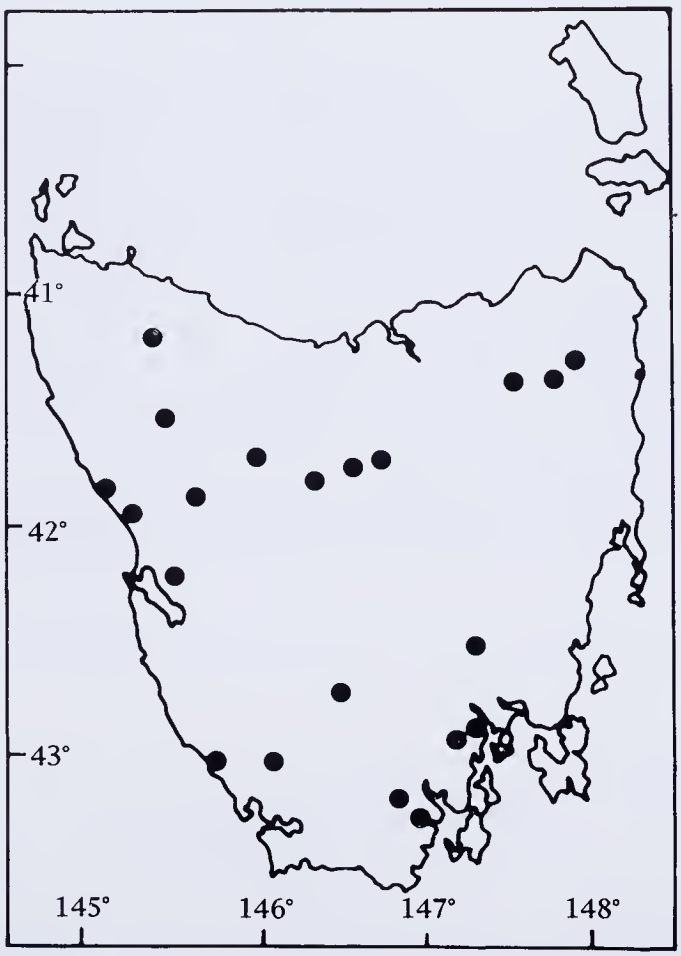

Fig. 2. Tasmanian distribution of *Bacidia albidoplumbea* (based on collections at HO).

DISTRIBUTION

Bacidia albidoplumbea is currently known from New Zealand and Tasmania (Figure 2). In New Zealand, Galloway (1985) notes that the species is widespread, mainly in coastal and lowland areas, on the bark of trees and shrubs such as *Hoheria*, *Dacrydium* and *Sophora*. In Tasmania, the species is common and widespread in cool temperate rainforest where it is a pioneer of twigs and trunks with smooth bark (Kantvilas & James 1991). It occurs in shaded microhabitats and is a prominent component of the *Opegrapha stellata* — *Coccotrema cucurbitula* community of Kantvilas (1988b: 415). Although mostly found on *Atherosperma moschatum*, *B. albidoplumbea* has also been recorded from *Nothofagus cunninghamii* and *Lagarostrobos franklinii*. It is also known from wet sclerophyll forest where it grows as an epiphyte of *Pomaderris apetala* and *Zieria arborescens*.

ACKNOWLEDGEMENTS

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Manuscript received 6 July 1992

DILLWYNIA SIEBERI DISTINGUISHED FROM *D. JUNIPERINA* (FABACEAE: MIRBELIEAE) IN SOUTH-EASTERN AUSTRALIA

David E. Albrecht[1] and Michael D. Crisp[2]

ABSTRACT

Albrecht, David E. and Crisp, Michael D. *Dillwynia sieberi* distinguished from *D. juniperina* (Fabaceae: Mirbelieae) in south-eastern Australia. ***Muelleria* 8(1): 47–50 (1993).** — Two species which hitherto have been confused under the name *Dillwynia juniperina* Lodd. are distinguished and described. The name *D. sieberi* Steudel is reinstated here for a species which occurs in Queensland, New South Wales and Victoria, and a lectotype chosen for the name. *D. juniperina sensu stricto* occurs in Victoria and New South Wales. The possible occurrence of both species in Tasmania is discussed.

INTRODUCTION

During the course of servicing a routine identification enquiry at the National Herbarium of Victoria it became apparent that two species have been confused under the name *Dillwynia juniperina* Lodd. The two species concerned are readily distinguished by the mode of leaf attachment and no intermediates have been observed. We have applied the name *D. juniperina sensu stricto* to the species that has a scattered distribution in Victoria and occurs in a few sites in southern New South Wales, and have reinstated the name *D. sieberi* Steudel for the species that occurs in south-eastern Queensland, New South Wales and a restricted area in eastern Victoria. A key to distinguish *D. sieberi* from *D. juniperina* is given below.

Dillwynia juniperina and *D. sieberi* both belong to a group within the genus (*D.* sect. *Xeropetalum* R. Br. *ex* Sims) which is easily distinguished by its abruptly narrowed (as opposed to tapered) calyx base and petals remaining persistent in fruit. *Dillwynia juniperina* and *D. sieberi* differ from the other south-eastern Australian members of this section *viz. D. uncinata* (Turcz.) J. Black, *D. cinerascens* R. Br., *D. acicularis* Sieber *ex* DC. and an unnamed species from the Gibraltar Range in northern New South Wales in having truly pungent leaves.

It is curious that there are historical records of both species from Tasmania, yet contemporary evidence for either occurrence is lacking. Loddiges (1820) states that *D. juniperina* is a native of 'van Diemen's Island', although he does not give a source for this information. In the Vienna herbarium (W), there is a specimen of *D. sieberi* collected by Bauer 'ex insula van Diemen', which is annotated by Bentham, and presumably used by him in part to describe *D. juniperina* Sieber *ex* Benth. (see synonymy of *D. sieberi* below). We have seen no other report of any pungent-leaved taxon of *Dillwynia* from Tasmania. The Student's Flora of Tasmania (Curtis 1975) describes none. Jasmyn Lynch (personal communication), who has recently made an extensive survey of Fabaceae occurring in Tasmania, is unaware of any such species occurring there.

TAXONOMY

Key to distinguish Dillwynia sieberi from D. juniperina

1 Most leaves widely spreading or declinate, sessile; new growth with an indumentum of short appressed and longer diverging trichomes ..... 1. **D. juniperina**

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[2]Division of Botany and Zoology, Australian National University, GPO Box 4, Canberra, ACT 2601 Australia

1* Most leaves ascending to widely spreading, rarely declinate, with a short yellowish petiole 0.4–1.2 mm long; new growth with an indumentum of short appressed trichomes or rarely also with longer diverging trichomes .....2. **D. sieberi**

1. Dillwynia juniperina Lodd., Bot. Cab. 5: t. 401 (1820). TYPE: 'This plant is a native of Van Diemen's Island, whence we received seeds of it in the year 1818.' (specimen unknown; **lecto, here chosen**: the plate).

Spreading shrub to 2 m tall with short appressed and frequently also longer diverging peltate trichomes on the branchlets, raceme axis, pedicels, bracts, bracteoles, calyx and gynoecium. *Leaves* rigid, sessile, glabrescent, mostly widely spreading or declinate, linear-subulate, trigonous with a longitudinal adaxial groove, 6–15 mm long, 0.6–0.9 mm wide, apex with a pungent point 0.7–1.2 mm long; *stipules* minute, inconspicuous. *Racemes* terminating the main axes or short lateral branches, or in the upper axils, to 4.5 cm long. *Pedicels* to *c.* 3 mm long; *bracts* ovate, often minutely pungent, mostly 1–1.5 mm long but the lowermost sometimes leaf-like; bracteoles ovate, ± minutely pungent, 0.6–1 mm long, attached on the pedicel just below the base of the calyx tube. *Calyx* 3–4.5 mm long, abruptly narrowed at the base; lower lobes much shorter than the tube; upper lobes united into a broad emarginate lip. *Corolla*: yellow with reddish-brown markings; *standard* transverse-elliptic or depressed ovate, emarginate, 5.5–8 mm long (including 1.5–2 mm claw), 6.5–10 mm wide; *wings* obovate, auriculate, 5–8 mm long (including 1.5–2.5 mm claw), 1.2–2.5 mm wide; *keel* longitudinally half-ovate, auriculate, 4–5.5 mm long (including 1.5–2.5 mm claw), 1.5–2 mm wide. *Stamens* with filaments 2–4.6 mm long; *anthers* versatile, 0.3–0.5 mm long. *Gynoecium* 4–5 mm long including 0.3–0.4 mm stipe and 1.5–2.2 mm abruptly hooked style, glabrous towards the stipe base and style apex; *stigma* capitate; *ovules* 2. *Pod* ovoid, turgid, c. 5–6 mm long, surrounded by the persistent remains of the petals; *seeds* unknown.

Flowering period: August to November. *Fruiting period*: Immature pods collected from November to January.

SELECTED SPECIMENS (38 specimens examined)

New South Wales — South Western Slopes: Benambre State Forest, 15 km S of Culcairn, 35°45′S, 147°05′E, 4 Oct. 1978, *J.G. Bricknell 80* (NSW); Central Tablelands: 4 miles E of Abercrombie Caves near Barragan's Mtn, 33°55′S, 149°22′E, 3 Oct. 1965, *B.G. Briggs s.n.* (NSW).

Victoria — Riverina: Boweya Flora & Fauna Reserve, 12 Sep. 1985, *A.C. Beauglehole 80363* (MEL, CBG, NSW); Midlands: Warby Range, c. 5 km direct NW of Mt Warby, 36°19′S, 146°11′E, 11 Oct. 1986, *M.G. Corrick 9958* (MEL, NSW); Eastern Highlands: Rose Valley-Cheshunt Road, near Cheshunt, 36°51′S, 146°31′E, 10 Oct. 1990, *T.J. Entwisle 1765 & S. Bodsworth* (MEL, PERTH, CBG); East Gippsland: Timbarra River Natural Feature Zone, 14 Sep. 1984, *A.C. Beauglehole 77006* (MEL, CBG).

DISTRIBUTION

New South Wales: Central Tablelands, Central Western Slopes and South Western Slopes botanical subdivisions. Victoria: Midlands, Eastern Highlands and East Gippsland natural regions (Conn 1993†). *D. juniperina* appears to be quite rare in New South Wales, where it is known only from near Culcairn, Trunkey and Bowan Park. In Victoria it has a disjunct distribution pattern, occurring in the Warby and Strathbogie Ranges, near Tallarook, Bruthen, Whitfield and Alexandra, and in the catchments of the Timbarra and Snowy Rivers.

HABITAT

D. juniperina grows in dry sclerophyll forests and woodlands typically dominated by Box or Ironbark-type *Eucalyptus* species. Plants are found on hillsides or

† 1:1 000 000 Colour map printed by National Herbarium of Victoria.

ridges where the soil is usually shallow and often skeletal. Most populations occur in areas where the underlying parent rock is granite.

Discussion

No type specimens of Loddiges are known. However, the published plate appears to be diagnostic for the species which has spreading to deflexed, sessile leaves, and accordingly we have applied the name to this taxon. In the absence of a specimen, we have chosen the plate as the lectotype.

2. Dillwynia sieberi Steudel, Nomencl. Bot. ed. 2, 1: 509 (1840); — *Dillwynia cinerascens auct. non* R. Br.: DC., Prodr. 2: 109 (Nov. 1825); — *Dillwynia juniperina* Sieber *ex* DC., Prodr. 2: 109 (Nov. 1825), *nom. inval., pro syn.*; — *Dillwynia juniperina* Sieber *ex* Benth., Comm. Legum. Gen. : 15 (1837), nom. illeg., non Lodd. Type: **Lecto, here chosen**: *Sieber 411* [G-DC, microfiche seen; **isolecto**: BM (2 sheets), G, K (2 sheets), W (3 sheets), MEL (1 sheet)].

Erect or spreading shrub to 2 m tall with short appressed peltate trichomes and occasionally also similar but longer diverging trichomes on the branchlets, raceme axis, pedicels, bracts, bracteoles, calyx and gynoecium. *Leaves* rigid, glabrescent, mostly ascending to widely spreading or rarely some declinate, linear, trigonous with a longitudinal adaxial groove, 7–20 mm long, 0.4–0.8 mm wide, apex with a pungent point 0.5–1.5 mm long; *petioles* yellowish, 0.4–1.2 mm long; *stipules* minute, inconspicuous. *Racemes* terminating the main axes or short lateral branches, or in the upper axils, to 2.5 cm long. *Pedicels* to c. 3 mm long; *bracts* ovate, often minutely pungent, most 1–1.5 mm long but the lowermost sometimes leaf-like; *bracteoles* ovate, ± minutely pungent, 0.7–1 mm long, attached on the pedicel just below the base of the calyx tube. *Calyx* 3–5 mm long, abruptly narrowed at the base; lower lobes occasionally minutely pungent, much shorter than the tube; upper lobes united into a broad entire or emarginate lip. *Corolla*: yellow to yellow-orange with reddish-brown markings; *standard* transverse-elliptic or depressed ovate, emarginate, 5.5–9 mm long (including 1.5–2 mm claw), 7–12.5 mm wide; *wings* obovate, auriculate, 5–9.2 mm long (including 1.5–2.5 mm claw), 2–3.3 mm wide; *keel* longitudinally half-ovate, auriculate, 4.5–6 mm long (including 1.7–2 mm claw), 1.8–2.3 mm wide. *Stamens* with filaments 2.5–4.5 mm long; *anthers* versatile, 0.4–0.5 mm long. *Gynoecium* 3.5–5.2 mm long including 0.3–0.5 mm stipe and 1.2–2.2 mm abruptly hooked style, glabrous towards the stipe base and style apex; *stigma* capitate; *ovules* 2. *Pod* ovoid, turgid, c. 5–6 mm long, surrounded by the persistent remains of the petals; *seeds* 3–3.5 mm long, c. 2 mm wide, dark brown-black; *testa* smooth; *aril* present.

Flowering period: April to November. *Fruiting period*: Mature pods collected in December.

Selected Specimens (*c.* 150 examined)

Queensland — Darling Downs district: Racecourse Creek, 8 km NE of Wallangara, 28°52′S, 151°58′E, 25 Sep. 1973, *I.R. Telford 3170* (CBG, K, L, A, BISH); Moreton district: Falls Creek, 4 km NW of W Haldon, 27°45′S, 152°04′E, 2 Oct. 1988, *P.I. Forster 4747 & L.H. Bird* (BRI, CBG, MEL).

New South Wales — Central Coast: On the N side of the Old Pitt Town Road, 1 km from the Saunders Road intersection towards Scheyville Road, 33°37′S, 150°54′E, 19 Nov. 1986, *M.M. Richardson 46, G. Butler & S. Corbett* (CBG, MEL); Central Coast: Kemps Creek, 33°53′S, 150°47′30″E, 7 Sep. 1982, *R.G. Coveny 11280 & P. Hind* (NSW, CBG); Northern Tablelands: Bakers Creek Falls, c. 20 km E of Armidale, 30°33′S, 151°54′E, 31 Oct. 1984, *M.D. Crisp 7511 & J.M. Taylor* (CBG, MEL, NSW); Northern Tablelands: Gwydir Highway, 52.8 km E of Inverell, 29°44′S, 151°34′30″E, 10 Sep. 1986, *R.G. Coveny 12360 & J. Dalby* (NSW, CBG); Southern Tablelands: 3 km from Bungonia along road to Goulburn, 34°50′S, 149°55′E, 24 Jul. 1988, *M.D. Crisp 8197* (CBG, A, NSW); Southern Tablelands: 1.0 km along road to Captains Flat from the Kings Hwy turn-off, 35°21′S, 149°16′E, 25 Sep. 1986, *M.D. Crisp 7847 & J.D. Briggs* (CBG, JRAU, MEXU, MO); North Western Slopes, 2 km past Copeton Dam on road from Inverell towards Bingara, 3 Sep. 1975, *B. Muffett M5/289* (CBG); Central Western Slopes: Mitchell Hwy, 15.7 km W of Dubbo on route to Nyngan, 32°14′S, 148°23′E, 17 Aug. 1987, *R.G. Coveny 12593, P. Cuneo & B. Weicek* (NSW, CBG).

Victoria — Eastern Highlands: Headwater of Stony Creek on the Mt Margaret Track, 1 km due S from Mt Ronald, 37°37'S, 146°41'40"E, 28 Apr. 1992, *D.E. Albrecht 4964 & N.G. Walsh* (MEL, CBG, NSW, BRI).

Distribution

Queensland: Burnett, Darling Downs, Maranoa, Morton and Wide Bay pastoral districts. New South Wales: Central Coast, South Coast, Northern Tablelands, Central Tablelands, Southern Tablelands, North Western Slopes and Central Western Slopes botanical subdivisions. Victoria: Eastern Highlands natural region. *D. sieberi* is relatively widely distributed in New South Wales, but in Queensland is confined to the south-eastern corner of the state, and in Victoria is restricted to the Macalister River catchment.

Habitat

D. sieberi typically grows in dry *Eucalyptus* or *Callitris* forests and woodlands, and often occurs on sites with exposed surface rock or skeletal substrates. However, it also grows in more mesic sites such as moist sclerophyll forests, as is the case in some Victorian populations.

Discussion

Steudel (1840) considered that de Candolle (1825) had misapplied the name *Dillwynia cinerascens* R. Br. to what was in fact an unnamed taxon. Therefore he provided the new name *Dillwynia sieberi*, based upon Sieber's description. De Candolle cited only a single specimen, namely *Sieber 411*, which is extant in de Candolle's herbarium in Geneva, and it is chosen here as the lectotype. It should be noted that *Dillwynia juniperina* Sieber *ex* DC., which was based upon this same specimen, is an invalid nomenclatural synonym of *Dillwynia cinerascens* R. Br., because de Candolle (Nov. 1825) cited it under that name.

ACKNOWLEDGEMENT

Helen Thompson assisted with the compilation of nomenclatural information in this paper.

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Loddiges, C.L. (1820), *Dillwynia juniperina. Bot. Cab.* 5: t. 401.

Manuscript received 28 July 1992.

A NEW SPECIES OF *PULTENAEA* (FABACEAE) IN VICTORIA

M.G. Corrick*

ABSTRACT

Corrick, M.G. A new species of *Pultenaea* (Fabaceae) in Victoria. ***Muelleria* 8(1): 51–53 (1993).** — *Pultenaea victoriensis* M.G. Corrick *sp. nov.* from western Victoria is described as new.

PULTENAEA VICTORIENSIS

Pultenaea victoriensis M.G. Corrick *sp. nov.*

P. scabra R. Br. affinis foliis glabris, marginibus tuberculatis; stipulis adpressis, 1–1.5 mm longis; inflorescentia terminali flore singulari (raro floribus duobus), bracteis infernis persistentibus; bracteolis glabris, 3.5–5 mm longis; 1.5–2 mm latis differt.

TYPUS: Victoria, Western Grampians, Victoria Range Track, 3–4 km south of its junction with Victoria Range Road, 14 Nov. 1991, *M.G. Corrick 10793* (HOLOTYPUS: MEL; ISOTYPI: PERTH, CBG, HO, K).

Shrub 0.5–3 m high, young branchlets covered with appressed tubercle based hairs, older branches becoming glabrous-tuberculate and finally glabrous. *Leaves* alternate; lamina more or less flat on upper surface with mid-rib depressed and margin slightly recurved; cuneate or obovate to oblong 4–13(-15) mm long × 2–4(-5) mm wide, tip obtuse or emarginate with short, blunt, recurved mucro; upper surface shiny, minutely tuberculate towards the edges and round the margin; lower surface dull and paler than the upper, midrib prominent and minutely tuberculate; petiole 0.75–1 mm long, tuberculate and occasionally on young growth with a few short hairs which extend to the base of the undersurface of the leaf. *Stipules* 1–1.5(–2) mm long, appressed to the stem. *Inflorescence* usually of a single flower or rarely two at the tips of the short lateral branchlets. *Bracts* 6–9 per flower, broadly to narrowly ovate, 1.5–8 mm long × 1.5–5 mm wide, mid-brown, scarious, glabrous except for ciliate margins and a small pubescent patch at the base; bracts initially completely enclosing the developing bud but inner bracts deciduous at anthesis leaving 2–3 small outer bracts persistent. *Calyx* 6–8 mm long, densely covered with appressed silky hairs, lobes acuminate 1.5–2 mm long, upper two lobes slightly broader and less deeply divided than lower three. *Bracteoles* 3.5–5 mm long × 1.5–2 mm wide, mid-brown, scarious, glabrous except for ciliate margins and a few pale hairs at the base, inserted at about the middle of the calyx tube and extending beyond the tips of the calyx lobes. *Standard* 11–14 mm long × 11–14 mm wide, deep yellow with a pale patch at the base surrounded by dark red radiating lines, wings deep yellow 10–11 mm long, 3–3.5 mm wide, keel petals dark red shading to cream at the base 10–11 mm long, 3–3.5 mm wide. *Stamens* 10, free, filaments 9–10 mm long. *Ovary* sessile, 2 ovulate, 2–2.5 mm long, style slender and gently curved 7–7.5 mm long, ovary and base of style densely covered with pale appressed hairs. Pod broadly and obliquely ovate 7–9 mm long, lower half pubescent and enclosed by the calyx, glabrous internally, seed obliquely ovoid 2.5–3 mm long × 2 mm wide, dark brown with aril intricately divided into a cluster of slender threads. (Fig. 1)

REPRESENTATIVE SPECIMENS (total number examined 13)

Victoria — Grampians, Victoria Range, Mt Thackeray, 26 Jan. 1969, *A.C. Beauglehole 30350* (MEL); Castle Rock, 11 Dec. 1966, *J.H. Willis & A.C. Beauglehole s.n.* (MEL 663306); Victoria Range Track, 28 Nov. 1965, *M.G. Corrick 5871a* (MEL, PERTH).

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Fig. 1. *Pultenaea victoriensis*. a — flowering twig ×1. b — stem section showing stipules ×3. c — calyx opened out showing bracteoles ×4. d — seed, side view ×8. e — bract ×4. f — wing petal ×4. g — keel petal ×4. h — standard ×4. i — gynoecium ×4. j — pod ×4. a–i from *M.G. Corrick 10793* (MEL); j from *M.G. Corrick 5807* (MEL).

Discussion

Pultenaea victoriensis is confined to the upper rocky slopes of the Grampians' Victoria Range between the Chimney Pot and Mt Thackeray above about 800 m altitude. This area is extremely rugged with most parts accessible only on foot. It is therefore likely to be more widely distributed here than present records show. Its habitat is steep rocky sandstone slopes usually with open forest of *Eucalyptus baxteri*, *E. obliqua* and *Banksia saxicola* with a dense shrub understorey; around Castle Rock (also known as The Fortress) it is found in open situations among rocks. It appears to be a favoured food of browsing macropods which may account for the small size and twiggy growth of plants exposed along the margins of tracks or in the crevices of rock platforms. This taxon has previously been regarded as a possible hybrid between *P. scabra* and *P. benthamii* or as a form of *P. scabra* (Corrick 1984). However, *P. victoriensis* is distinctive in its usually single flowered inflorescence with persistent bracts and in the glabrous leaves with small stipules appressed to the stem. *P. scabra* and the hybrids differ in having an inflorescence of more than 2 flowers, usually 4 or 5 with all the bracts deciduous by the time the flowers are open. The leaves of *P. scabra* differ in being scabrid and hairy with longer, dark brown recurved stipules. The leaves of the hybrid populations show a gradation of variation between the parents but in all collections are hairy, at least on the lower surface. *P. scabra* is widespread in the Victoria Range but does not appear to occur above about 800 m altitude, at least in the type locality of *P. victoriensis*. *P. benthamii* is recorded only in the southern Victoria Range near Brown's Creek. No hybrid populations have been observed there.

ACKNOWLEDGEMENTS

I am most grateful to Jim Ross for advice and for allowing me continued access to the facilities and collections at MEL, to Neville Walsh for the Latin diagnosis and to Anita Barley for executing the accompanying illustration.

REFERENCE

Corrick, M.G. (1984) Bush-peas of Victoria — genus *Pultenaea* Sm. Fabaceae — 20. *Victorian Naturalist* 101: 200–203.

Manuscript received 19 August 1992.

NOTES ON *PULTENAEA GUNNII* Benth. (FABACEAE) IN AUSTRALIA AND DESCRIPTION OF A NEW SUBSPECIES FROM VICTORIA

M.G. CORRICK*

ABSTRACT

Corrick, M.G. Notes on *Pultenaea gunnii* Benth. (Fabaceae) in Australia and description of a new subspecies from Victoria. **Muelleria 8(1): 55–56 (1993).** — *Pultenaea gunnii* in Australia is discussed and several names are reduced to synonymy. A new subspecies, *P. gunnii* subsp. *tuberculata*, is described from Victoria. It is noted that *P. gunnii* subsp. *gunnii* collected from southern New South Wales in 1837 has not subsequently been recorded in that state.

INTRODUCTION

Pultenaea gunnii is a polymorphic species within which several varieties have been described; apart from one distinctive population from the Brisbane Range in Victoria, these have proved impossible to circumscribe when viewed against the range of variation exhibited in currently available collections of which over 250 have been examined. Some existing names are therefore reduced to synonymy under *P. gunnii* and a new subspecies from the Brisbane Range is described.

P. gunnii is widespread in Tasmania and in central and eastern Victoria. It was also collected in New South Wales by Mueller from 'barren ranges near Mount Imlay', in September 1860, but has apparently not been collected subsequently from that locality.

TAXONOMY

Pultenaea gunnii Benth. in Comm. Legum. Gen. 18 (June 1837). TYPE: 'Van Diemen's land Gunn'. (Possible SYNTYPES: (2 sheets) MEL 1600255 and 504796).

P. gunnii Benth. var. *prostrata* Hook.f. Fl. Tasmaniae 1:88 (May 1856). TYPE: not clearly designated.

P. gunnii Benth. var. *erecta* Hook.f. Fl. Tasmaniae 1:88 (May 1856) *nom. illeg.* as this appears to be the type variety.

P. gunnii Benth. var. *baeckeoides* Rodway. The Tasmanian Flora p. 33 (1903). TYPE: 'on dry hills'. (Possible SYNTYPE: MEL 35439).

P. gunnii Benth. var. *flava* Ewart in Vict. Nat. 24:190 (Apr. 1908). HOLOTYPE: Wandin, 11 Oct. 1907, *P.R.H. St John* (MEL 627540).

P. gunnii Benth. var. *planifolia* F. Muell. *ex* Williamson, in Proc. Roy. Soc. Vict. 32 (ns.) Pt. 2 : 215 (1920). LECTOTYPE (here selected): *Mueller s.n.*, no date or locality (MEL 1600288; see notes below).

P. baeckeoides A. Cunn. ex Benth. in Comm. Leg. Gen. 19 (June 1837). TYPE: Van Diemens Land, A. Cunn.

COMMENTS

Williamson's publication of *P. gunnii* var. *planifolia* F. Muell. cites the type as a 'broad-leaved form from Badger Head, Tas.' There are two sheets in MEL labelled var. *planifolia* in Mueller's hand-writing; both are undated and without locality details. On one of these sheets there is also a fragment (presumably broken from the main specimen) which was recovered from Williamson's Herbarium. This fragment is labelled 'var. *planifolia*' in Williamson's hand-writing. There is

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one other old collection in MEL from Badger Head (*Stuart 959*) determined by Williamson as *P. gunnii* Benth. but the specimen does not fit in with what I believe was Mueller's and Williamson's concept of the var. *planifolia*. It seems likely that the locality 'Badger Head' in Williamson's protologue may have been a slip of the pen. I have therefore chosen as the lectotype the sheet carrying annotations by both Mueller and Williamson.

NEW SUBSPECIES

Pultenaea gunnii Benth. subsp. **tuberculata** M.G. Corrick *subsp. nov.*

ab ullo forma subspeciei typicae foliis parvis elipticis (1.5–3 mm longis, 1–1.5 mm latis), margine plano tuberculo crasso levitur, pagina supera tuberculata et costa in pagina inferna prominenti differt.

TYPUS: Victoria — Brisbane Range, Switch Track, 1.5 km south of junction with McLeans Highway, 1 Nov. 1991, *M.G. Corrick 10790* (HOLOTYPUS: MEL; ISOTYPI: PERTH, CBG, HO, NSW, K.)

REPRESENTATIVE SPECIMENS (total number examined 13)

Victoria — Brisbane Range, beside Acroplane Track near its junction with Mistletoe Track, 12 Jan. 1992, *M.G. Corrick 10798* (MEL); Anakie, 26 Oct. 1923, *A.C.F. Gates 638* (MEL); 12 km SW of Bacchus Marsh, near Reids Road, 11 Nov. 1976, *T.B. Muir 5477* (MEL).

DISTRIBUTION

This taxon is confined to the rocky slopes and ridges of the Brisbane Range in Victoria in *Eucalyptus sideroxylon*, *E. obliqua*, *E. macrorhyncha* mixed forest.

KEY TO THE SUBSPECIES OF PULTENAEA GUNNII

1. Leaves usually widest below the middle, margin recurved; upper surface of leaf glabrous, smooth or slightly wrinkled, lower surface with pale, loosely appressed hairs (rarely glabrous); mid-rib obscure..... subsp. **gunnii**
1. Leaves widest at the middle, leaf margin thickened and tuberculate, but not recurved, upper surface of leaf tuberculate, lower surface glabrous; midrib prominent .....subsp. **tuberculata**

ACKNOWLEDGEMENTS

I am most grateful to Jim Ross for advice and for continued access to the collections and facilities at MEL, to Terry Macfarlane for advice, to Neville Walsh for the Latin diagnosis and to the Curator of HO for the loan of specimens.

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NOTES ON *ISOETES* AND *TMESIPTERIS* IN VICTORIA

R.J. CHINNOCK*

ABSTRACT

Chinnock, R.J. Notes on *Isoetes* and *Tmesipteris* in Victoria. ***Muelleria* 8(1): 57–60 (1993).** — A new species of *Isoetes*, *I. pusilla* Marsden & Chinnock, and a new subspecies, *I. drummondii* subsp. *anomala* Marsden & Chinnock, are described and illustrated. *Tmesipteris obliqua* Chinnock is also described as a new species and replaces *T. billardieri* Endl. an illegitimate name.

INTRODUCTION

The second volume of the Flora of Victoria is expected to be published in the latter part of 1993, before Volume 48 (Gymnospermae and Pteridophyta) of the *Flora of Australia*. For this latter work I have prepared treatments of a number of fern and fern-ally groups some of which contain new taxa and three of these are required for use in the *Flora of Victoria* so they are here treated formally.

ISOETES L.

In 1979 C. Marsden, who had undertaken a morphological and taxonomic study of *Isoetes* in Australasia and surrounding areas, submitted a doctoral thesis to the University of Adelaide. Unfortunately this work, which included a number of new species and taxa of lower rank, was never formally published but with the permission of Dr Marsden I have prepared a modified treatment of the Australian species for the *Flora of Australia* based on his thesis. I have not altered in any way his concepts in *Isoetes* with the exception of raising a variety to subspecies.

1. **Isoetes pusilla** Marsden & Chinnock, *sp. nov.*

Isoetes pusilla Marsden *ex* Britton & Brunton, Fern Gaz. 14, 2:79 (1991) *nom. nud.*

Herba amphibia parva, cormo bilobo vel trilobo; foliis 4–8, spiratim depositis, flexibilibus; fibris peripheralibus et pilis internis absentibus; stomatibus praesentibus; ligula late triangula; labio absenti; sporangiis ellipticis ad orbiculatis, translucentibus; velamene sporangium tegenti; microsporis superficiebus proximalibus laevibus, superficie distali spinea; megasporis typis I, 0.35–0.45 mm diametro; superficiebus proximalibus cristis humilibus acutis anastomosantibus, superficie distali reticulata, in sicco alba vel cana.

TYPUS: Victoria, Mt Pilot Scenic Reserve, N of Beechworth, 8 Dec. 1973, *A.C. Beauglehole 43797* (HOLOTYPUS: AD; ISOTYPUS: MEL).

Small amphibious *herb*. *Corm* very small, 0.3–0.5 cm in diam., 2- or 3-lobed, lobes small. *Roots* brownish, thin and wiry. *Leaves* 4–8, 2–6 cm long ± erect or recurved, light green with pale bases. *Peripheral fibre* strands and internal hairs absent, stomates present. *Lacunar* walls 1–2 cells thick, translacunar diaphragms clearly visible (fresh or dried) through leaves. *Leaf bases* dilated into translucent membranous wings 4–5 mm across at base and extending a short distance along the leaf margins above the sporangium, tapering gradually. *Ligule* minute, triangular, broader than long, *c.* 0.75 mm across. *Labium* absent. *Velum* present, pale, translucent, usually completely covering the sporangia. *Sporangia* very small, orbicular to elliptic, 1.5–2 × 2–3 mm, megasporangia containing 10–20 megaspores. *Sporangial wall* thin, translucent, wall cells not thickened, rarely pigmented. *Megaspores* monomorphic, Type I (see Marsden 1976, p. 42) only produced, 345–435 μm in diam., white or pale grey when dry, ornamented on both

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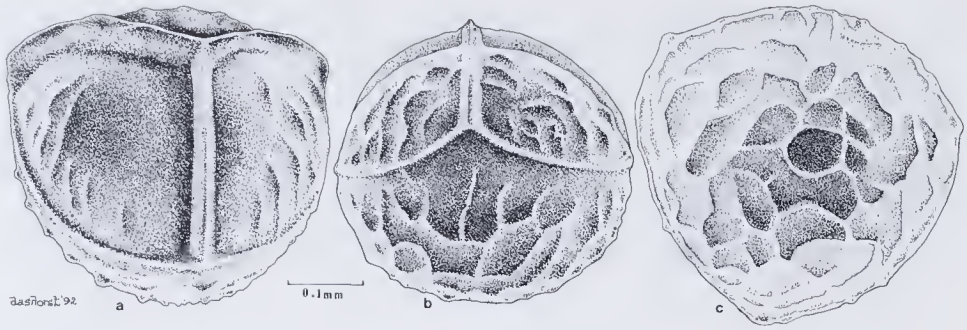

Fig. 1. *Isoetes pusilla*. a — proximal view, b — side view, c - distal view of megaspore. Drawn from scanning electron micrographs of isotype (MEL).

proximal and distal faces by narrow, low, sharp, anastomosing ridges, becoming reticulated on distal faces (Fig. 1c), megaspore surface covered by a matted meshwork bearing recurved spinules. *Tri-radiate ridges* straight, narrow and high, semi-bladelike, covered with recurved spinules like spore surface. *Commissural ridges* straight, very narrow and low, produced to small points where tri-radiate ridges adjoin. *Microspores* rusty brown in colour, 28–33 × 20–25 µm, distal faces covered with ± conical spines, proximal faces ± smooth or with slight projections. (Fig. 1a-c)

Distribution and Ecology

Isoetes pusilla is known only from Victoria.

Very little has been recorded concerning the habitat and growth cycle of populations of *I. pusilla*. This species is only recorded from shallow rock pools, and according to Marsden (1979) appears to follow a similar growth pattern to *I. muelleri* from the same areas.

Notes

Isoetes pusilla resembles *I. muelleri* but differs in having a more angular ornamentation on the megaspores and producing only monomorphic spores. In addition, *I. pusilla* usually produces microspores whilst in *I. muelleri* they are extremely rare.

Plants of *I. pusilla* are usually smaller than those of *I. muelleri*, although the size of plants of the latter species is very variable.

The specific name *pusilla* refers to the small stature of this species.

Specimens Examined

Victoria — Near Minyip, Wimmera, Nov. 1892, *J.P. Eckert* (AD, MEL); Hawkesdale, Sep. 1903, *H.B. Williamson* (LE); Chiltern, Nov. 1910, *H.B. Williamson* (MEL); Beechworth, Dec. 1922, *H.B. Williamson* (CANB).

2. **Isoetes drummondii** subsp. **anomala** Marsden & Chinnock, *subsp. nov.*

Isoetes drummondii var. *anomala* Marsden *ex* D. Britton & D. Brunton, Fern Gaz. 14, 2:73 (1991) *nom. nud.*

Ab subspecie typica megasporis irregulari Typi III aliquot Typi I, microsporis absentibus chromosomatum numero 4n = 44, 5n = 55 differt.

Typus: South Australia, Comaum Forest Reserve, swamp in centre of pines near Arleena, 19 Dec. 1973, *C.R. Marsden 33 & K.M. Alcock* (Holotypus: AD; Isotypi: MEL, NSW).

Corm 2-(3-) lobed. *Sporangia*: megasporangia only produced, orbicular to obovate not usually as elongate as in subsp. *drummondii* up to 5 × 8 mm, con-

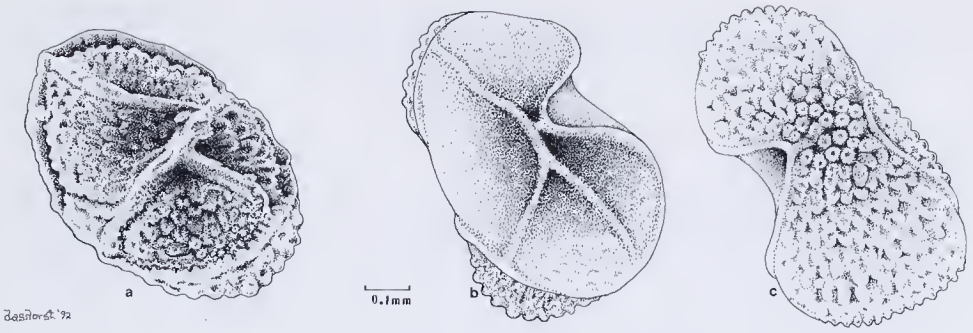

Fig. 2. *Isoetes drummondii* subsp. *anomala*. a — proximal view of megaspore. Drawn from scanning electron micrograph. b–c proximal and distal view of megaspore. a–c based on holotype.

taining *c.* 50–200 megaspores. *Megaspores* irregular, mostly Type III with a few Type I produced. *Megaspores* tuberculate, tubercles usually crowded and sometimes confluent into short cristae. *Megaspore* covered with dense spinules. *Commissural ridges* as for subsp. *drummondii*. *Microspores* not observed. (Fig. 2a-c)

KEY TO SUBSPECIES

1 Megaspores regular, Type I only; megasporangia and microsporangia produced ..... subsp. **drummondii**

1. Megaspores irregular, mostly Type III with a few Type I; microsporangia not produced ..... subsp. **anomala**

Specimens Examined

Western Australia — Gnarlbine Rock, 16 Sep. 1975, *R.J. Chinnock P1093* (AD); Petruda Rocks, E of Pithara, 23 Jul. 1971, *N.G. Marchant 71/310* (AD)

South Australia — 4 km SW of Wandilo, Mt Gambier Forest Reserve, 1973, *B. Grigg* (AD); Comaum Forest Reserve, 19 Dec. 1973, *C.R. Marsden 33 & K.M. Alcock* (AD) (Type); W of Durr Swamp, Southeast, 23 Dec. 1973, *K.M. Alcock* (AD).

Victoria — 2.5 km N of Beechworth on Wodonga Rd., 2 Nov. 1952, *E.J. McBarron 5931* (NSW); Hawkesdale, Feb. 1904, *H.B. Williamson* (AD); Warmwillah, March 1904, *H.B. Williamson* (MEL); 5.5 km NNW of Creswick, 3 Jan 1953, *J.H. Willis* (MEL); Chiltern, Dec. 1910, *s.dat.* (LE).

New South Wales — 5 km S of Gregory, 24 Dec. 1952, *E.J. McBarron 5905* (NSW).

Notes

Whether *I. drummondii* subsp. *anomala* is a good subspecies or a interspecific hybrid is not yet certain. However, Britton & Brunton (1991) hold the view that this taxon is probably of hybrid origin. It is pentaploid*, lacks microspores and has Type 3 megaspores (irregular dumbell-shaped and large monolete forms) which are all indicative characteristics of known *Isoetes* hybrids (eg. Brenton & Taylor 1990, Button & Brunton 1991). Furthermore they consider that although *Isoetes drummondii* subsp. *drummondii* is cited only as a diploid (Marsden 1979) micropore and megaspore size ranges suggest that populations with higher ploidy are involved. They consider a hidden allotetraploid may be in the complex and that subsp. *anomala* could be the result of a cross between the undescribed 4*x* (unreduced) and 2*x drummondii* although a wider cross is not ruled out.

*Marsden (1973) recorded the subspecies as pentaploid but in 1979 he also recorded it as a tetraploid.

The epithet refers to the abnormal condition of this subspecies which does not produce microspores and has largely Type III megaspores.

TMESIPTERIS Bernh.

Tmesipteris obliqua Chinnock, *sp. nov.*
T. billardieri Endl., Prod. Fl. Norf. 6 (1833) *nom. illeg.*

> Surculi aerii 15–70 cm longi, unici vel semel furcate, pendentes vel plus minusque erecti, foliis spiralibus, 2 vel 3 per cm, 12–28 mm longis, 4–12 mm latis, oblongo-lanceolatis, basibus obliquis apicibus truncatis ad emarginatis raro aliquot obtusis. Synangium biconicum, 5–9 mm longum.

Type: Tasmania, below Russel Falls, Mt Field National Park, Dec. 1974, *R.J. Chinnock P1007* (Holotype: AD; Isotype: HO).

Plant epiphytic or rarely terrestrial. *Aerial shoots* 15–70 cm long, continuing growth for several years but eventually terminated by a small sterile or sporogenous leaf, unbranched or occasionally forked once, pendulous or rarely suberect, lower portion of shoot below leaves ribbed only on one side. *Leaves* spirally arranged, 2–3 per cm, 12–30 mm long, 4–12 mm wide towards base, broadly oblong-lanceolate, base oblique with adaxial margin parallel to branch near base and then abruptly projecting away from it, apex truncate to emarginate, rarely some obtuse, mucronate, surfaces shiny. *Synangia* at intervals along stem or towards tip, biconic, gradually tapering, persistent, 5–9 mm long, length *c.* 3 times height. *n* = *c.* 200, 203–210, 208–214, H.N. Barber, *Proc. Linn. Soc. N.S.W.* 82: 203 (1957). Long fork-fern.

Distribution and Ecology

Tmesipteris obliqua extends from southern New South Wales through Victoria and Tasmania where it is common on the trunks and bases of tree-ferns, *Todea barbara* and in humus accumulations on banks and around tree bases. In terrestrial situations the shoots become suberect but curved in the distal part.

Notes

Unfortunately Endlicher (1833) included *Psilotum truncatum* R. Br. in the synonymy of his new species *T. billardieri* thus making the name illegitimate.

Tmesipteris obliqua is the largest and most robust of the Australian species with aerial shoots attaining lengths of up to 70 cm although shoots of 20–40 cm are more commonly encountered. The leaves, which can be up to 12 mm wide, have very oblique bases and the specific epithet is derived from this feature.

Selected Specimens

Victoria — Kallista, Monbulk Forest, 15 Jun. 1958, *R. Schodde 779* (AD, CANB); Aire River, base of Phillips track, 19 Oct. 1984, *R.J. Chinnock 6478* (AD, MEL).

New South Wales — Mt Wilson, 14 Apr 1953, *R. Melville 3775 & M.D. Tindale* (K, MEL); 10 km NNW of Bemboka, 2 Oct. 1982, *I.R. Telford 8852* (AD, CBG, NSW).

Tasmania — Derwent, no date, *R. Brown* (Bennett No. 122) (MEL 52375); Mt Wellington, 8 Jan. 1931, *E.A. Atkinson 58* (CANB); Brittons Swamp, 21 km SW of Smithton, 29 Nov. 1974, *R.J. Chinnock P965* (AD, HO).

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Marsden C.R. (1979). Morphology and taxonomy of *Isoetes* in Australasia, India, north-east & south-east Asia, China & Japan. Ph.D. thesis, Department of Botany, Adelaide (unpublished).

Manuscript accepted 14 September 1992

A NEW SPECIES OF *CALLISTEMON* R. Br. (MYRTACEAE) FROM EAST GIPPSLAND

W. Molyneux*

ABSTRACT

Molyneux, W. A new species of *Callistemon* R. Br. (Myrtaceae) from east Gippsland. ***Muelleria* 8(1): 61–64 (1993).** — *Callistemon forresterae* is described. Its relationship with *Callistemon subulatus* is discussed, and a discussion is entered into on the secondary role of the nectary/staminal ring. An illustration is provided.

INTRODUCTION

This is the first of a number of apparently new species of *Callistemon* from eastern Gippsland to be described. Like this species, they have remained mainly uncollected, or sparingly so, often due to the remoteness of their localities, and the limited numbers of plants in populations. This species is described from material collected or subsequently propagated from a single specimen, which was first collected by the author as an 'unusual form of *C. subulatus*', a confusion caused by habitat and proximity in growing close to this last named species.

All measurements and observations are taken from living material, from both the original collection and from subsequent second and third generation plants grown on the author's property.

TAXONOMY

Callistemon forresterae W. Molyneux *sp.nov.*

C. subulato E. Cheel affinis cortice grisea chartacea, foliis largioribus, costa prominenti in paginis ambabus foliorum, conflorescentia longiore malvina, floribus numero plus, staminibus numero plus 12(13–15)17 mm longis, fructibus largioribus et florescentia longiore differt.

Typus: Victoria, Upper Genoa River, Gippsland, below the New South Wales border, 37°16′S, 149°22′E, Apr. 1980, *W.M. Molyneux and S.G. Forrester sn*; Holotypus: MEL; Isotypi: NSW, CANB.

Shrub, erect, compact, ±1.2 metres tall and ±1 metre wide, with a single straight main stem; branches erect; new growth sericeous pink with short, mostly reclining hairs, soon becoming green. *Bark* hard, papery, grey, whiter and tightly wrapped at base of stem. *Leaves* moderately dense, spreading at ±45° to stem and branches, petioles twisted, aligning leaves more or less edge ways on to stems; lamina flexible, coriaceous, broadly linear to linear lanceolate, mucronate, often falcate, 22(33–43)55 mm long, 2.5(3.0 & 4.0)5 mm wide, mid-vein slightly raised and discernible on both surfaces, margins thickened, rounded, secondary venation not apparent, oil glands dark, scattered on both surfaces. *Conflorescence* usually distally frondose, held above horizontal or drooping, averaging 74 flowers per head, 60(90–120)120 mm long, 38(42–46)50 mm wide, rachis with short medium density sericeous hairs; green leaf-like bracts with red irregular markings, densely villous at base, regularly interrupt and attend flowers in upper end of spike, usually in top one third, as occasionally do leaves, but neither consistently; bracts dry chaffy brown, deciduous at or before anthesis. *Perigynium* 6–7 mm long, 2.5–3 mm wide, hirsute with short erect white hairs; sepals chaffy, 1 mm long, 1.8 mm wide; petals green, 4 mm long, 2.5 mm wide, with thin white margins. *Stamens* 16(20)26 per flower, 12(13–15)17 mm long; filaments free, mauve;

*Belfast Road, Montrose, Victoria, Australia 3765.

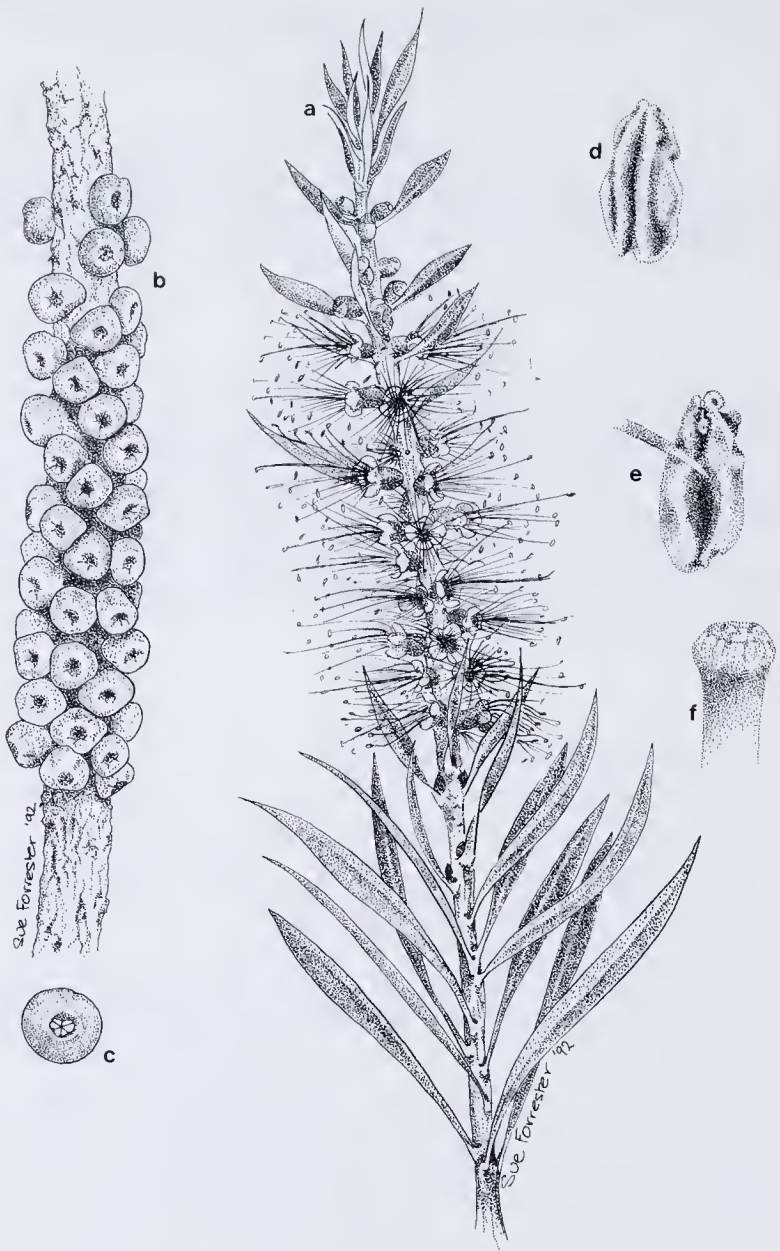

Fig. 1. *Callistemon forresterae* a — Flowering branch ×0.8. b — Fruiting group ×0.8. c — Single fruit, which is trilocular and sutured ×2.5. d — Anther, front view ×25. e — Anther, back view ×25. f — Style end, pollen presenter ×20.

anthers 0.8 mm, purple, gland obvious. *Ovary* trilocular, densely sericeous on summit *c.* 1 mm across, and *c.* 1 mm below rim; style nearly straight or curving, exceeding stamens by 3–10 mm, mauve, 17(20–22)24 mm long, hardly expanded behind the shallowly capitate pollen presenter, persistent after stamens fall. *Nectary* (staminal ring) expands soon after stamen drop to partially close over and

protect part of ovary summit. *Fruit* squat, often truncate, 5–8 mm wide, 4–6 mm deep, densely packed on stems, orifice 0.75–1.75 mm wide, 1 mm deep, not appearing to shed up to 8 years. (Fig. 1)

Flowering time

Mid-October to mid-January; possibly autumn.

Distribution and Habitat

Known with certainty from one collection as 'an unusual *Callistemon subulatus*' by W.M. Molyneux and S.G. Forrester found growing out of a rock bar on the west bank of the Genoa River, less than 1 metre above autumn water levels. *C. subulatus* is not uncommon in this region, growing similarly on rock bars and on higher ground near water.

In discussing comparisons between *C. forresterae* and *C. subulatus* mention needs to be made of a possible anomaly in a distribution record of the latter.

Willis (1973, p. 451) comments that *C. subulatus* is a . . ."riparian shrub ± 4 ft high, from Nowa Nowa eastwards".

I am not aware of *C. subulatus* further west than Cann River, some 120 km to the east of Nowa Nowa, and there are no records from the Snowy River, a waterway which could support its riparian habit.

A compact form of *C. citrinus* does grow at Nowa Nowa on Ironstone Creek, but this is unlikely to be mistaken for *C. subulatus*, the Nowa Nowa record of which is most likely a case of an incorrect locality recording.

Notes and Table

The following table compares major differences between *C. forresterae* and *C. subulatus*; while not included in this table, *C. linearifolius* shows affinities to both compared taxa.

Table of Comparisons between *Callistemon forresterae* and *Callistemon subulatus*

C. forresterae	C. subulatus
Upright shrub ± 1.2 m tall, ± 1 m wide, with hard grey papery bark, becoming whiter and tightly wrapped at base of stem.	Arching shrub ± 1 m tall, ± 1.2 m wide, with hard dark grey interwoven bark.
Leaves broad linear to linear lanceolate, often falcate, petioles twisted at ±90°	Leaves linear, mostly 90° to stems, petioles not twisted or hardly so.
Mid-vein raised on both surfaces, oil glands dark, scattered on both surfaces. Faintly citrus smell when crushed, 22(33–43)55 mm long, 2.5(3 & 4)5 mm wide.	Mid-vein obvious on lower surface, grooved, numerous small yellow or green oil glands on both surfaces. Faintly offensive smell when crushed, 15(23–28)41 mm long, 1(1–2)3 mm wide.
Conflorescence erect horizontal or drooping. Av. 74 flowers per head, 60(90–120)120 mm long, 38(42–46)50 mm wide.	Conflorescence pendant or drooping. Av. 56 flowers per head, 40(45 and 75)75 mm long, 30(34 and 48)48 mm wide.
Perigynium 6–7 mm long, 2.5–3 mm wide, hirsute with short erect white hairs; sepals chaffy, 1 mm long, 1.8 mm wide. Petals green with fine white margins, 4 mm long, 2.5 mm wide.	Perigynium 4–5 mm long, 2 mm wide, glabrous; sepals white or reddish, 1 mm long, 1.2 mm wide. Petals green, cupped, 3 mm long, 1.5 mm wide.
Stamens 16(20)26 per flower, mauve, 12(13–15)17 mm long; anthers purple, 0.8 mm.	Stamens 14(16–18)19 per flower, crimson, 8(12–20)20 mm long; anthers crimson, 1 mm.
Style nearly straight or lightly curved, mauve, 17(20–22)24 mm long, exceeding stamens by 3–10 mm, hardly expanded behind shallowly capitate pollen presenter.	Style straight or curved, crimson, 10(10–19 & 21-22)23 mm long,exceeding stamens by 2–3 mm or often of same length, expanded abruptly behind shallowly capitate pollen presenter.

Floral bracts leaf-like, green with red markings, villous at base, drying chaffy, deciduous either at or before anthesis, interrupt and attend flowers in the upper one-third of spike. Not consistent. Leaves occasionally interrupt spikes in upper one-third.	Floral bracts absent, or if present then filiform, reddish, with long fine white hairs, becoming deciduous at or before anthesis, or upper end of spike consistently interrupted by leaves.
Flowering mid-Oct. to mid-Jan., possibly autumn.	Flowering early Nov. to late Dec., variable.
Capsules squat, often truncate, 5–8 mm wide, 4–6 mm deep, orifice 0.75–1.75 mm wide, 1 mm deep, densely packed on stems; not shedding up to 8 years.	Capsules wine-glass shaped to squat, 2.5–4 mm wide, 2–4 mm deep, orifice 1–3 mm wide, 1 mm deep, densely packed to crowded on stems. Often shedding after 4 years.
Cultivation notes: At 8 years a tall upright to slightly weeping multi-stemmed (3–8) shrub to 2.5 m tall, 2–2.2 m wide. Diameter of each individual stem *c.* 180 mm at 30 cm above ground level. Suckers from roots if damaged.	Cultivation notes: At 8years a small arching shrub, weeping, mostly a single but occasionally multiple (2–4) stemmed shrub to 1–1.2 m tall,1–1.5 m wide. Diameter of stem *c.* 170 mm at 30 cm above ground level.

Etymology

The specific epithet recognises one of the co-collectors of this new species, Susan Glen Forrester, and her contribution to horticulture, her writing and illustrating.

Discussion on secondary role of nectary/staminal ring

The filaments are attached to the top of an irregularly shaped ring in the throat of the floral tube, which is also the source of nectar. It would seem that nectar either rises up or is forced by pressure into the base of the filaments which are broader than upper parts of filaments, often more lightly coloured and, I would assume, porous. It is through this porous part of the filament that nectar exudes and sits in the bottom of the tube totally immersing the top of the ovary.

When pollination is complete, filaments fall and nectar flow ceases with a consequent drying-up of the general area. Prior to or concurrent with the style falling, the nectary/staminal ring commences to grow inward, to eventually form a partial shield over the top of the ovary, its eventual size determining the aperture.

In longitudinal section, this closing over forms a variable sized aperture, either almost closed or obviously open between what was the dome of the ovary and the former underside of the nectary/staminal ring, and whereas the apices of the capsules of *C. forresterae* are easily distinguished, in other species they are often densely hairy.

My guess on the function of these mechanisms is that they protect the ovary, assist temperature control to limit dessication, and deny entry to predators likely to raid seed.

ACKNOWLEDGEMENTS

Thanks are to be given to Dr Roger Spencer, with whom many discussions have been had on *Callistemon*; to Neville Walsh for willingly providing the Latin diagnosis; and to Sue Forrester for her illustrations and typing of the manuscript.

REFERENCE

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Manuscript accepted 5 October 1992.

A NEW SPECIES OF *MARSILEA* L. (MARSILEACEAE) FROM AUSTRALIA

David L. Jones*

ABSTRACT

Jones, David L. A new species of *Marsilea* L. (Marsileaceae) from Australia. ***Muelleria* 8(1): 65–67 (1993).** — *Marsilea costulifera* is described and illustrated with notes on distribution and habitat.

INTRODUCTION

The opportunity is taken here to formally describe an entity related to *Marsilea angustifolia* R. Br., to facilitate use of the new name in the 'Flora of Victoria'. Chinnock (1978) was the first to recognize the distinctiveness of this taxon and his interpretation has been followed in other publications (Chinnock 1986, Duncan & Isaac 1986), although Andrews (1990) treated *M. angustifolia* in the broad sense while noting the comments of Chinnock.

TAXONOMY

Marsilea costulifera D.L. Jones *sp. nov.*

M. angustifoliae R. Br. affinis sed habitu robusto minore, foliolis brevioribus oblanceolatis vel cuneatis, squamis sporocarpiorum parvioribus et sporocarpiis minoribus costatis valde et concavis dorsaliter differt.

Holotypus: New South Wales: Gilgunnia, 32°25′S, 145°56′E, 31 Dec. 1903, *W. Baeuerlen 3175* (NSW).

Rhizomatous perennial fern forming patches; rhizomes slender, creeping, rooted at nodes, much-branched, glabrous except at the tips, bearing sterile fronds and sporocarps. *Sterile fronds* arising in clusters at nodes, erect on plants growing in mud, floating when growing in water; stipes 1–12 cm long, glabrous or hairy; juvenile sterile fronds often with a single small obovate leaflet; mature sterile fronds with 4 leaflets; leaflets oblanceolate to cuneate, 1–12 mm long, 1–5 mm wide, glabrous or sparsely hairy, outer margin entire, flat to shallowly rounded, arranged unequally at the apex of the stipe. *Sporocarps* clustered, borne singly on unbranched pedicels, 2.5–3 mm long, 1.8–2 mm wide, *c.* 1 mm thick, at right angles to the pedicel, brown, densely scaly, distinctly ribbed, apex broadly rounded, upper surface concave, one basal tooth prominent, the apex of the pedicel forming a second less-prominent, tooth-like protruberance; pedicels 1–2 mm long, more or less shorter than the sporocarp, glabrous or scaly. (Fig. 1)

Representative Specimens (55 collections examined, all at Herb. NSW) (an additional 36 collections are located at MEL ed.)

New South Wales — Cumberoona Reserve, Bowna, 35°57′S, 147°07′E, 18 Apr. 1948, *E.J. McBarron 1681*; Corowa Rd, Albury, 36°02′S, 146°42′E, 16 Oct. 1947, *E.J. McBarron 1159*; 'Pelora' *c.* 80 km north-west of Louth, 30°18′S, 144°40′E, 22 Sep. 1978, *C.W.E. Moore*; Mulwarrina Ck, Mulgowan Station, south of Bourke, 30°33′S, 145°49′E, 17 Oct. 1963, *E.F. Constable 4567B*; Cobar township, 31°30′S, 145°50′E, 11 Nov. 1969, *E.J. McBarron* 18421A; Doonside, 33°46′S, 150°52′E, Apr. 1967, *R. Coveny s.n.*; *c.* 5 km north-east of 'Noonarah' homestead, 30°08′S, 143°56′E, 4 Oct. 1971, *J.C. De Nardi 909*.

Victoria — (the following collections at MEL have not been seen by the author but have been added to indicate the distribution of this species in Victoria ed.) -33 miles W of Mildura, 25 Oct. 1972, *A.C. Beauglehole 40647*; Lake Powell, 16 km SE of Robinvale, 4 May 1977, *A.C. Beauglehole 56162*; *c.* 2 km ESE of Toolern Vale, Dec. 1988, *I. Tankard s.n.*; Wyperfield National Park 3½ miles SW of

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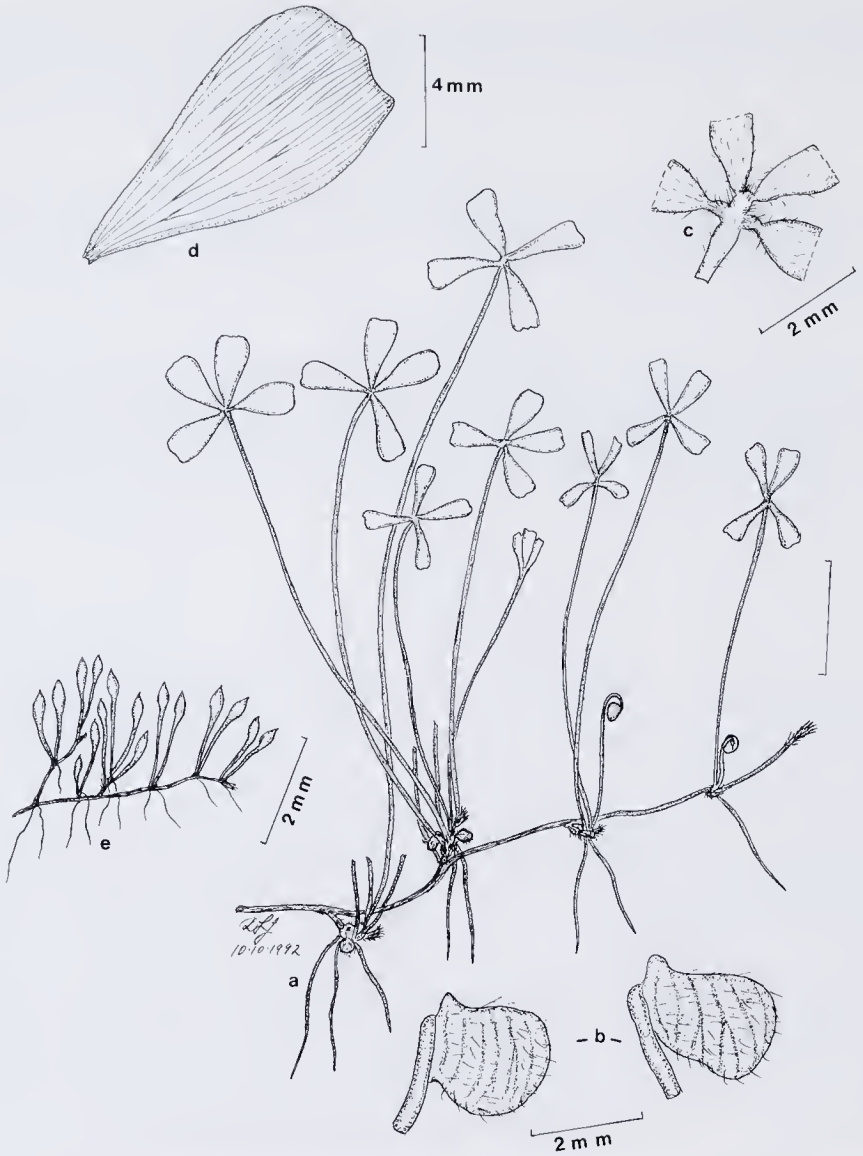

Fig. 1. *Marsilea costulifera* D. Jones. a — portion of a plant. b — sporocarps. c — base of frond showing arrangement of leaflets. d — leaflet. e — portion of young plant showing juvenile fronds. (a–d from the Type collection; e from Booberoi Ck, NSW, *K.L. Wilson 5848*).

Wonga Hut, 18 Sep. 1968, *A.C. Beauglehole 28492*; Barmah State Park, 28 Sep. 1985, *A.C. Beauglehole 81281*; Upper Glenelg River, *c.* 3 miles below Cherry Pool, 6 Mar. 1948, *J.H. Willis s.n.*

South Australia — Upper Murray River, Swan Reach, 34°34′S, 139°35′E, 19 May 1974, *R.J. Chinnock P899*; above Renmark, near junction of Chowilla Ck and Moolamon Ck, 38°05′S, 140°42′E, 13 Sep. 1979, *D.E. Symon 11581*.

Queensland — Gilruth Plains, Cunnamulla, 28°04′S, 145°41′E, 7 July 1949, *R. Roe s.n.*

Distribution and Habitat

Coastal and inland localities in Queensland, New South Wales, Victoria and South Australia. Grows in mud on the verges of swamps and billabongs, in shallow water and less commonly among grass in moist depressions.

NOTES

This species can be distinguished from *M. angustifolia* by its much less robust habit, with sterile fronds to 12 cm long (to 30 cm long in *M. angustifolia*), shorter, relatively broader, oblanceolate to cuneate leaflets (narrowly cuneate in *M. angustifolia*), smaller scales on the sporocarps and smaller (2.5–3 mm × 2 mm × 1 mm), distinctly ribbed sporocarps which are usually concave on the upper surface (5.5 mm × 4 mm × 2.5 mm, shallowly and indistinctly ribbed and upper surface convex in *M. angustifolia*). *M. angustifolia* is strictly tropical in its distribution in Western Australia and the Northern Territory, whereas *M. costulifera* is widespread from subtropical to temperate regions. The distributions of each do not overlap.

CONSERVATION STATUS

Widely distributed, locally common and probably well conserved.

ETYMOLOGY

From the Latin **costula**, diminutive of rib, **ferens**, carrying, bearing; in reference to the distinctive small ribs on the sporocarps.

ACKNOWLEDGEMENTS

I thank Neville Walsh (MEL) for preparing the Latin diagnosis, Mark Clements (CBG) for commenting on the manuscript and Corinna Broers (CBG) for technical assistance.

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Revised manuscript accepted 22 October 1992

THE STATUS OF RECENTLY NAMED ORCHIDS FROM SOUTH-EASTERN AUSTRALIA

MARK A. CLEMENTS*

ABSTRACT

Clements, Mark A. The status of recently named orchids from south-eastern Australia. ***Muelleria* 8(1): 69–72 (1993).** — The status of orchid taxa described in two recent publications is determined based on a study of the types. *Caladenia formosa* G.W. Carr, *C. flavovirens* G.W. Carr, *C. fulva* G.W. Carr, *C. venusta* G.W. Carr, *C. verrucosa* G.W. Carr, *C. versicolor* G.W. Carr and *Gastrodia procera* G.W. Carr are respectively conspecific with the following which are here reduced to synonymy; *Caladenia haemantha* D. Jones, *C. beaugleholei* D. Jones, *C. demissa* D. Jones, *C. floribunda* D. Jones, *C. rigens* D. Jones, *C. aerochila* D. Jones and *Gastrodia entomogama* D. Jones. *Caladenia dilatata R. Br.* subsp. *villosissima* G.W. Carr, *C. montana* G.W. Carr, *C. oenochila* G.W. Carr, *C. simulans* G.W. Carr and *Chiloglottis grammata* G.W. Carr are conspecific with and here respectively reduced to synonyms of *Caladenia tentaculata Schldl.*, *C. fitzgeraldii* Rupp, *C. lindleyana* (H.G. Reichb.) M. Clements & D. Jones, *C. dilatata* R. Br. and *Chiloglottis gunnii* Lindley.

INTRODUCTION

In 1991 one hundred and thirty new names for Australian orchids were published in two separate publications. In February 1991 Carr published new names for twenty two taxa in the genera *Caladenia*, *Chiloglottis* and *Gastrodia* from Victoria in a publication entitled 'Indigenous Flora and Fauna Association Miscellaneous Paper No. 1 (1991)' (Carr 1991). Two months later the descriptions of one hundred and eight new species and natural hybrids in the genera *Acianthus*, *Arthrochilus*, *Caladenia*, *Chiloglottis*, *Corybas*, *Dipodium*, *Diuris*, *Gastrodia*, *Genoplesium* and *Prasophyllum*, from all over the continent, were published by Jones in the second volume in the monographic series 'Australian Orchid Research' (Jones 1991). The contrast in presentation between these two publications is enormous.

Carr's publication contained the names of the new taxa, a brief Latin diagnosis, a type citation, a list of representative specimens examined, distribution, notes, conservation status and etymology sections. There are no botanical descriptions for any of the new taxa and only one is illustrated, that on the front cover of the publication. By comparison, the paper by Jones consisted of the full descriptions, a Latin diagnosis, a type citation and illustration of all taxa, and in some cases colour plate of the new species. Irrespective of these differences in presentation, study of the texts reveals that a number of species have apparently been described by both authors.

VALIDITY OF THE PUBLICATIONS AND TAXA

In accordance with the relevant articles of the International Code of Botanical Nomenclature (ICBN) both publications are valid and meet the requirements as places for the publication of new plant names. In both cases the new names contained within have been validly published although in the case of Carr's paper, only the minimum needed to validate a new name has been provided. There are also many factual and orthographic errors throughout the Carr text and two names, *Caladenia formosa* and *C. parva*, are missing from the abstract. The

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meagre descriptions and lack of illustrations make it difficult for anyone, without access to the types, to determine accurately the correct application of these new names.

Despite its shortcomings, Carr's publication predates that of Jones by two months, so where the same species was described by both authors, Carr's name has priority. The purpose of this paper therefore is to enunciate the status of Carr's taxa and to determine which of the species described by Jones (1991) and other authors are affected by his work.

TAXONOMY

Caladenia australis G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 2–3 (8 Feb 1991). *Caladenia reticulata auct. non* Rupp: Nicholls, Orchids Aust. 67, t. 250 (1969).

Caladenia dilatata R. Br., Prod. 325 (1810). Type: 'Port Dalrymple', *R. Brown s.n.* (lectotype specimen (a) BM!). Notes: A recent re-examination of the type of *Caladenia dilalata* R. Br. plus comparison with fresh material from Tasmania has confirmed that Brown's name should be correctly applied only to a late flowering species with restricted distribution in Tasmania and southern Victoria. *C. simulans* and *C. corynepetala* are undoubtedly the same species and accordingly are here reduced to a synonym of *C. dilatata*. Clarification of the status of *C. dilatata* is the subject of another paper (Clements and Jones in prep).

[*Caladenia simulans* G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 14–15 (8 Feb 1991), **syn. nov.**].

[*Caladenia corynepetala* D. Jones, Aust. Orch. Res. 2: 22–23, f. 24, t. (1991), **syn. nov.**]

Caladenia dilatata R. Br. subsp. *villosissima* G.W. Carr = *Caladenia tentaculata* Schldl.

Caladenia fitzgeraldii Rupp, Victorian Naturalist 58: 199 (1942).

[*Caladenia montana* G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 4 (8 Feb 1991). **syn. nov.**] Notes: I have examined a number of collections of *Caladenia fitzgeraldii* from New South Wales and the ACT, including material collected from near the type site near Bathurst, and compared them with the type of *C. montana*. The two taxa are without doubt conspecific and *C. montana* is accordingly here reduced to a synonym of *C. fitzgeraldii*.

Caladenia formosa G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 4 (8 Feb 1991). Notes: Carr compares his new species with *C. patersonii* R. Br. and stated that it 'differs in being more robust with wholly dark reddish-purple flowers which are larger in all parts'. In fact there is overlap in size of flowers of these two species but the distinguishing features are clearly defined and illustrated by Jones under *C. haemantha*. *C. formosa* is actually more closely allied to *C. concolor* Fitzg. and has been interpreted as that species until the present.

[*Caladenia haemantha* D. Jones, Aust. Orch. Res. 2: 26, t., f. 29 (5 April 1991), **syn. nov.**]

Caladenia patersonii R. Br. var. *concolor auct. non* Fitzg.: J. Weber & R. Bates in Jessop & Toelken, Flora South Aust. Part IV: 2072 (1986).

Caladenia flavovirens G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 4–5 (8 Feb 1991). Notes: Previously confused with *C. pallida* Lindley; recent field studies have confirmed that *C. beaugleholei* D. Jones is synonymous (J. Jeanes pers. comm.).

[*Caladenia beaugleholei* D. Jones, Aust. Orch. Res. 2: 16–17, f. 16 (5 April 1991), **syn. nov.**]

[*Caladenia pallida auct. non* Lindley: Nicholls, Aust. Orch. t. 256 (1969).]

Caladenia fragrantissima D. Jones et G.W. Carr subsp. **orientalis** G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 6–7 (8 Feb 1991).

Caladenia arenaria auct. non Fitzg.: Nicholls, Vic. Nat. 56: 123–124, f. (1939); *Caladenia patersonii* R.Br. var. *arenaria* (Fitzg.) Nicholls, Vic.Nat. 59: 189 (1943).

Caladenia fulva G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 7–8 (8 Feb 1991). Type: 'Ironbark Reserve near Stawell, 37° 45'S., 143° 07' E., Victoria, Victorian plant grid J2, 16.x.1989, *P. Branwhite s.n.* (holotype: MEL; isotype CBG)'. Notes: The type of this species has never left ANBG (CBG) since being collcctcd by Peter Branwhite and forwarded to Canberra. Carr, who has never seen the type, gave virtually identical collection details to those provided by Jones in a manuscript of his 1991 paper sent to MEL in November 1990. The two type citations are quoted here for the purpose of comparison.

[*Caladenia demissa* D. Jones, Aust. Orch. Res. 2: 24, t., f. 26 (5 April 1991). Type: 'Victoria; Ironbark Reserve, near Stawell, 37° 45'S, 143° 07'E, 16 October 1989, *P. Branwhite s.n.* (holo CBG; iso CBG, MEL).', **syn. nov.**]

Caladenia insularis G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 7–8 (8 Feb 1991).

Caladenia lindleyana (H.G. Reichb.) M. Clements & D. Jones, Aust. Orch. Res. 1: 27 (1989).

Caladenia patersonii R. Br. var. *lindleyana* H.G. Reichb., Beitr. Syst. Pflanzenk. 66 (1871); *Caladenia filamentosa auct. non* R. Br.: Lindley, Gen. sp. orchid. pl. 421 (1840).

[*Caladenia oenochila* G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 11–12 (8 Feb 1991), **syn. nov.**] Note: The spreading habit of the lateral sepals and petals, narrowing labellum apex, and sigmoid calli in four rows and general yellow background colour of the flower with a red labellum, are all characters that readily identify *C. lindleyana* from its close ally *C. patersonii* R. Br. These are the same characters found in *C. oenochila* and therefore there can be no doubt that the species described by Carr is conspecific with *C. lindleyana* (D. Jones pers. comm.).

Caladenia lowanensis G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 9–10 (8 Feb 1991). Notes: One of the most distinctive species from the *C. reticulata* Fitzg. group named by Carr and at present known only from one site in the Victorian mallee.

Caladenia montana G.W. Carr = *Caladenia fitzgeraldii* Rupp

Caladenia oenochila G.W. Carr = *Caladenia lindleyana* (H.G. Reichb.) M. Clements & D. Jones

Caladenia parva G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 12–13 (8 Feb 1991).

Caladenia robinsonii G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 13–14 (8 Feb 1991).

Caladenia simulans G.W. Carr = *Caladenia dilatata* R. Br.

Caladenia tensa G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 15–16 (8 Feb 1991). Notes: A poorly understood species the existence of which has long been known in South Australia. It is one of a number of species within the *C. tentaculata* Schldl. complex.

Caladenia tentaculata Schldl.,Linnaea 20: 571 (1847). Type: 'Lofty Range', *O.* Behr ex herb. *W. Sonder s.n.* (holo ?B+; lectotype specimen (41b) K-L! vide Clements, 1989).

[*Caladenia dilatata* R. Br. subsp. *villosissima* G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 3–4 (8 Feb 1991), **syn. nov.**] Notes: Carr compares this taxon with *C. dilatata* and makes the comment that it may be difficult to distinguish them apart in some instances. *Caladenia dilatata* subsp. *villosissima* however shares features with several species within the *C. dilatata* complex and indeed is inseparable from *C. tentaculata* Schldl. *sens. lat.* and is accordingly here reduced to a synonym of it.

Caladenia thysanochila G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1):

16–17 (8 Feb 1991). Notes: Despite the fact that this species is currently only known from two plants it does appear to be distinct from all others in the genus and warrants the status it has been allocated pending further investigation.

Caladenia venusta G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 17–18 (8 Feb 1991).
[*Caladenia floribunda* D. Jones, Aust. Orch. Res. 2: 25–26, f. 28 (5 April 1991), **syn. nov.**].

Caladenia verrucosa G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 18–19, t. (8 Feb 1991).
[*Caladenia rigens* D. Jones, Aust. Orch. Res. 2: 32, t., f. 38 (5 April 1991), **syn. nov.**].

Caladenia versicolor G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 19–20 (8 Feb 1991).
[*Caladenia aerochila* D. Jones, Aust. Orch. Res. 2: 13, t., f. 13 (5 April 1991), **syn. nov.**].

Gastrodia procera G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 22–23 (8 Feb 1991).
[*Gastrodia entomogama* D. Jones, Aust. Orch. Res. 2: 63, t., f. 82 (5 April 1991), **syn. nov.**].

Chiloglottis grammata G.W. Carr = *Chiloglottis gunnii*.

Chiloglottis gunnii Lindley, Gen. Sp. Orchid. Pl. 387 (1840).
[*Chiloglottis grammata* G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 20–21 (8 Feb 1991), **syn. nov.**] Note: Carr's taxon is without doubt conspecific with *C. gunnii* Lindley *sens. str.* and is here reduced to a synonym of it (D. Jones pers. comm.).

Chiloglottis platychila G.W. Carr, Indig. Flora & Fauna Assoc. Misc. Pap. (1): 21–22 (8 Feb 1991).

CONCLUSIONS

Of the 21 names published by Carr, eight affect the work of Jones and these have been reduced to synonymy of Carr's species. In addition, five taxa described by Carr are conspecific with others already described elsewhere and are here accordingly reduced to synonyms of those names.

ACKNOWLEDGMENTS

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Revised manuscript accepted 22 October 1992

NEW SPECIES OF *PTEROSTYLIS* R. Br. (ORCHIDACEAE) FROM VICTORIA AND NEW SOUTH WALES

David L. Jones and Mark A. Clements*

ABSTRACT

Jones, David L. and Clements, Mark A. ***Muelleria* 8(1): 73–83 (1993).** — *Pterostylis aenigma*, *P. basaltica*, *P. cheraphila*, *P. chlorogramma*, *P. planulata* and *P. smaragdyna* from Victoria and *P. petrosa* from southern New South Wales (all Orchidaceae) are described as new.

INTRODUCTION

As part of continuing research into the systematics of Australian Orchidaceae (Clements 1989, Jones and Clements 1989a, 1989b, Jones 1991), the following species of *Pterostylis* R. Br. are described as new. All are from south-eastern Australia, with the majority being endemic to Victoria. The descriptions facilitate the preparation of the accounts of the genus for the 'Flora of Victoria' and 'Flora of Australia'.

TAXONOMY

Pterostylis aenigma D. Jones *et* M. Clements *species nova*

affinis *P. cucullatae* R. Br. sed habitu graciliore, flore majore angulosiore, sepalo dorsali et petalis multo longioribus, sepalis lateralibus angustioribus minus scabridis cum apicibus filiformibus longioribus, labello longiore angustiore multo curvato, et stigmate longiore angustiore differt.

Typus: Victoria, Knocker Track, Omeo, 37°06′S, 147°36′E, 11 Dec. 1989, *R. Clark s.n.* (Holotypus: CBG; Isotypi: CBG, MEL).

Tuberous, terrestrial herb growing in small groups. *Rosette* semi-basal around the scape to cauline; leaves 3–4, oblong-elliptical to oblong-lanceolate, 4–6 cm × 15–18 mm, mid green to dark green, entire, obtuse; petioles 4–10 mm × 2–3 mm, narrowly winged. *Scape* 15–28 cm tall, slender, smooth. *Sterile bract* 3–5 cm × 10–14 mm, linear-lanceolate, sheathing at the base. *Fertile bract* similar. Ovary 10–12 mm long, strongly ribbed. *Flower* solitary, 40–44 mm long, translucent white, striped and suffused with green and brown; galea gibbous at the base then erect before bending forwards, then flat or slightly decurved to the apex. *Dorsal sepal* 5.5–6.4 cm × 18–22 mm, inflated at the base then constricted and tapered to the acute apex, white with a dark median stripe, green margins and a green apex. *Lateral sepals* erect, loosely embracing the galea; sinus protruding as a slight bulge when viewed from the side, deeply ve-eed when viewed from the front; conjoined part 18–20 mm × *c.* 10 mm, narrowed to *c.* 4 mm across at the base, pale brown with darker stripes and suffusions, the ventral surface minutely scabrid, the upper margins inrolled, gradually tapered into the free points; free points 25–36 mm long, linear-tapered, involute, erect, held high above the galea. *Petals* 4–4.5 cm × 7–8 mm, obliquely linear-lanceolate, slightly falcate, subacute, central part white, rest green or brown; flange *c.* 1.3 mm across, flat, obtuse. *Labellum* erect, curved forwards prominently in the distal third, the apex protruding prominently through the sinus in the set position; lamina 18–21 mm × 3.5–4 mm, linear to linear-elliptical, tapered to the obtuse apex, dark chocolate brown throughout; callus *c.* 1 mm across, slightly raised, expanded at the apex; basal appendage 5–5.5 mm long, linear, shallowly curved, apex penicillate. *Column* 18–20 mm long, bent away from the ovary at about 50 degrees then erect, green. *Column wings* 6–7 mm

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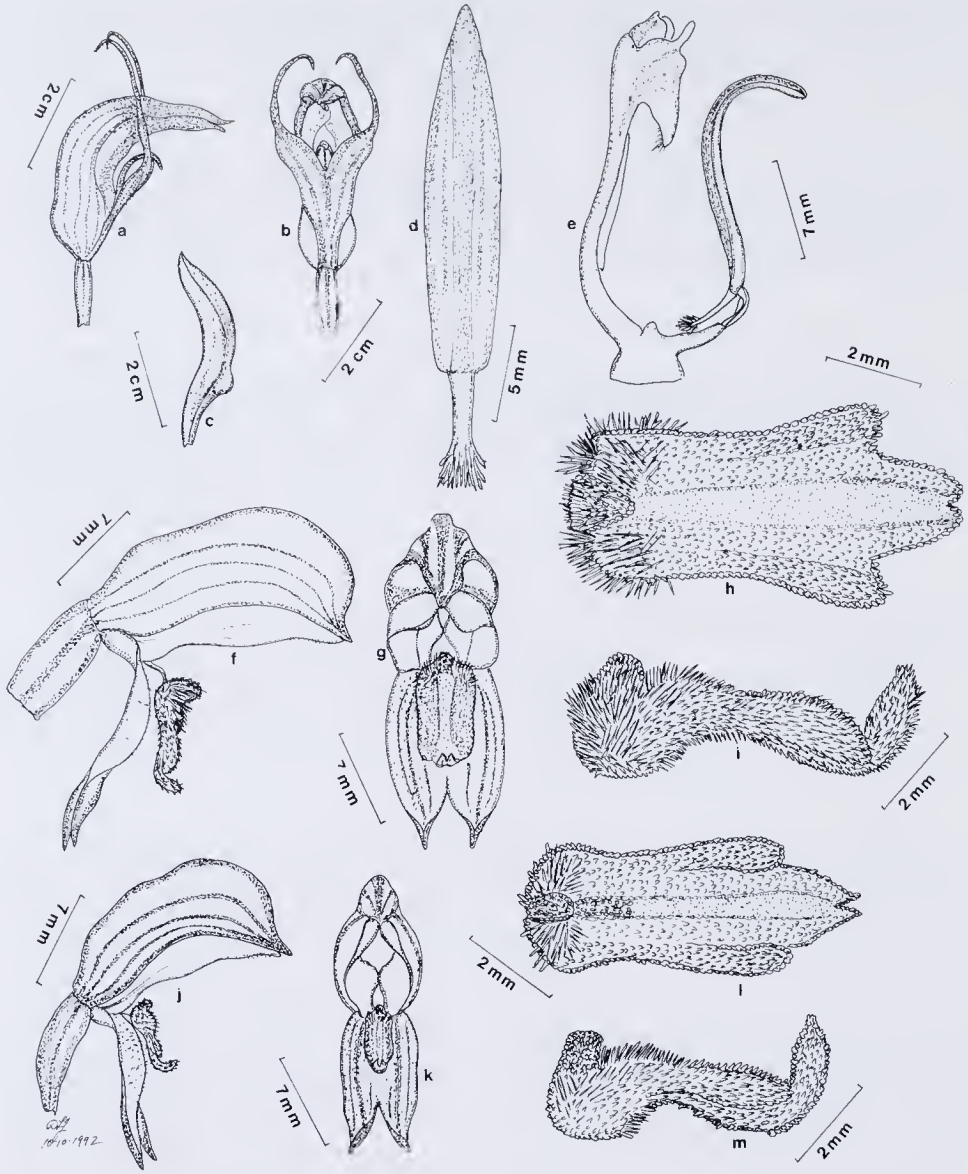

Fig. 1. a–e *Pterostylis aenigma* a — flower from side. b — flower from front. c — petal. d — labellum flattened out, from above. e — column and labellum from side. (drawn from the type collection).
f–i *Pterostylis smaragdyna* f — flower from side. g — flower from front. h — labellum flattened out, from above. i — labellum from side. (drawn from the type collection).
j–m *Pterostylis chlorogramma* . j — flower from side. k — flower from front. l — labellum flattened out, from above. m — labellum from side. (drawn from the type collection)

long; basal lobe 3–3.3 mm × *c.* 2 mm, green, at an angle of about 40 degrees, apex obtuse, inner margins incurved, sparsely adorned with short white cilia; mid section *c.* 3.5 mm long, dark green; apical lobe *c.* 1.4 mm long, linear, subacute. *Stigma* 9–11 mm × *c.* 2 mm , linear-oblong, raised. *Anther c.* 2 mm long, shortly rostrate. *Pollinia* 2.4–2.6 mm long, linear-clavate, falcate, yellow, mealy. *Capsule* not seen. (Fig. 1 a-e)

Distribution and Habitat

Known with certainty only from the vicinity of the type locality in Victoria. The Victorian habitat is mountainous and the species grows on flats along the floodplain of a stream in tall open forest, with a few plants occurring on moist slopes in small side gullies. Soils are grey to brown clay loams.

Flowering Period

November and December.

Notes

This species has been confused with *P. cucullata* R. Br. but has much smaller leaves, a thinner scape and larger, more angular flowers in which the labellum protrudes prominently from the sinus. Other floral differences include a much longer dorsal sepal and petals, narrower and less scabrid lateral sepals with longer free points, a longer, narrower, more prominently curved labellum and a longer, narrower stigma. The two species occupy different habitats with *P. cucullata* growing mainly in coastal and near-coastal habitats, although it does extend some distance inland in Victoria. Some collectors have suggested that the new species may be of hybrid origin perhaps involving *P. cucullata* and *P. furcata* Lindley. Although both species grow in the general area, only *P. furcata* grows in the immediate vicinity and the new species is represented by several small but actively reproducing colonies.

Conservation Status

Of restricted occurrence but poorly known and apparently some plants recently damaged by herbicides; suggest 2VK by criteria of Briggs & Leigh (1989).

Etymology

From the Latin **aenigma**, obscure, puzzling, baffling; in reference to the puzzling origin and distribution of this species.

Pterostylis basaltica D. Jones *et* M. Clements *species nova*

affinis *P. excelsae* M. Clements a qua floribus manifeste variegatae; sepalis lateralibus latioribus; labelli setis paucioribus brevioribus, lobo basali multo majore et apice producto, differt.

Typus: Victoria: near Woorndoo, 37° 55′S, 142° 57′E, 31 Dec. 1991, *P. Barnett s.n.* (*D.L. Jones 8689*) (Holotypus: CBG; Isotypi: CBG, MEL, AD).

Solitary, tuberous, terrestrial herb. Leaves elliptical, 15–28 mm × 6–9 mm, 8–15 in a stem-encircling, radical rosette, usually senescent at flowering. *Inflorescence* 9–25 cm tall, slender to moderately stout, with 3–5 sheathing, ovate-lanceolate, acuminate stem leaves 15–30 mm × 7–9 mm. *Floral bracts* 10–20 mm long ovate-lanceolate, acuminate, closely sheathing. *Pedicels* 8–30 mm long. *Ovary* 6–9 mm long. *Flowers* 1–15, transparent with green or greenish-brown suffusions, porrect to semi-erect; galea gibbous at the base, curved uniformly, decurved suddenly to the apex; proximal flanges of petals separated and not touching at the base of the galea. *Dorsal sepal* 12–14 mm long, cucullate, obliquely erect, abruptly decurved in distal third, 3 brown lines prominent, apical point 6–9 mm long, filiform, acuminate, straight or usually upcurved. *Lateral sepals* deflexed, green to greenish-brown with translucent areas; conjoined part flat or shallowly concave, 6–7 mm × 9–12 mm, the margins slightly thickened, with a few short clear cilia on the exterior surface; sinus narrow, the segments divergent; free points 12–15 mm long, filamentous, deflexed, *c.* 5 mm apart at the tips. *Petals* ovate-lanceolate, 14–16 mm × 5–6 mm, slightly falcate, acuminate, transparent with brown lines, dorsal ridge with numerous cilia, proximal flange poorly developed. *Labellum* highly irritable on a curved claw *c.* 3.5 mm long; lamina more or less ovate, 4.5–5.5 mm × 2.7–3 mm, greenish to brownish, moderately thin, constricted in the proximal quarter, widest at base and near the middle, narrowed to a

somewhat drawn-out, subacuminate apex; lateral margins with 6–8 pairs of white, obliquely erect trichomes, the proximal pair longest (*c.* 3 mm long), widely spreading; basal lobe whitish, swollen, with 4 trichomes *c.* 1.5 mm long; underside with a narrow deep central channel extending nearly to the apex, bordered by a white siliceous band. *Column* 12–14 mm long, curved. *Column wings c.* 3 mm × 2 mm, more or less rectangular, anterior margins incurved, ciliate. *Stigma* 5.5–6.5 mm × *c.* 2 mm, narrowly elliptical, upper margin coarsely crenate. *Anther c.* 2 mm long, obtuse. *Pollinia c.* 2 mm long, linear-clavate, yellow, mealy. *Capsule* not seen. (Fig. 2 a-d)

Distribution and Habitat

Endemic to south-western Victoria. Grows among rocks on basalt outcrops which are scattered in grassland and sparse woodland, often with *Acacia paradoxa*, in red-brown loam. Grasses predominate in the habitat, particularly *Themeda triandra*, and the orchids can be difficult to discern at flowering time.

Flowering Period

November to January.

Notes

This species, part of the *Pterostylis excelsa* complex, can be distinguished from *P. excelsa* by its generally broader flowers (especially the lateral sepals), prominent markings and the labellum which has fewer, shorter marginal trichomes, a much larger basal lobe and the mid-lobe tapers to a drawn-out apex. It is one of very few species of the 'rufa' group to grow on soils of basaltic origin.

Conservation Status

Apparently uncommon to rare, perhaps restricted to roadside verges and not conserved (P. Barnett pers. comm.); suggest 2E according to Briggs and Leigh (1989).

Etymology

In reference to its apparent prediliction for growing on basaltic soils.

Pterostylis cheraphila D. Jones *et* M. Clements *species nova*

affinis *P. maximae* M. Clements et D. Jones sed foliis brevioribus angustioribus rosulatis; floribus minoribus nitentibus brunneis; et labello minore, anguste ovato ad ovato.

Typus: Victoria: Wimmera River, near Dimboola, 36°25′S, 141°59′E, 20 Oct. 1989, *P. Branwhite s.n.* (*D.L. Jones 5333*) (Holotypus: CBG; Isotypi: CBG, MEL).

Solitary, tuberous, terrestrial herb. Leaves linear-ovate to linear-elliptical, 6–22 mm × 3–6 mm, sessile to subsessile, obtuse to acute, 6–12 in a radical, stem-encircling rosette, usually senescent at flowering. *Scape* 6–25 cm tall, slender to moderately stout, with 3–5 closely sheathing, ovate-lanceolate, acute to acuminate stem leaves. *Floral bracts* 12–25 mm long, ovate-lanceolate, closely sheathing, acute to acuminate. *Pedicels* 10–22 mm long, slender. *Ovary* 8–10 mm long. *Flowers* 1–7, transparent with dark reddish-brown suffusions in the galea, shiny, porrect to semi-erect; galea strongly gibbous at the base, more or less gently curved, although somewhat flattened at the top, decurved suddenly to the apex; proximal petal flanges widely separated and not closing off the base of the galea. *Dorsal sepal* 13–17 mm long, cucullate, obliquely erect, abruptly decurved in the distal quarter, apical point 7–11 mm long, filiform, long-acuminate, porrect to upcurved. *Lateral sepals* deflexed, reddish brown, shiny; conjoined part shallowly concave, 6–8 mm × 10–14 mm, the margins slightly incurved, with numerous white trichomes *c.* 0.5mm long; sinus very narrow, the lobes divergent; free points

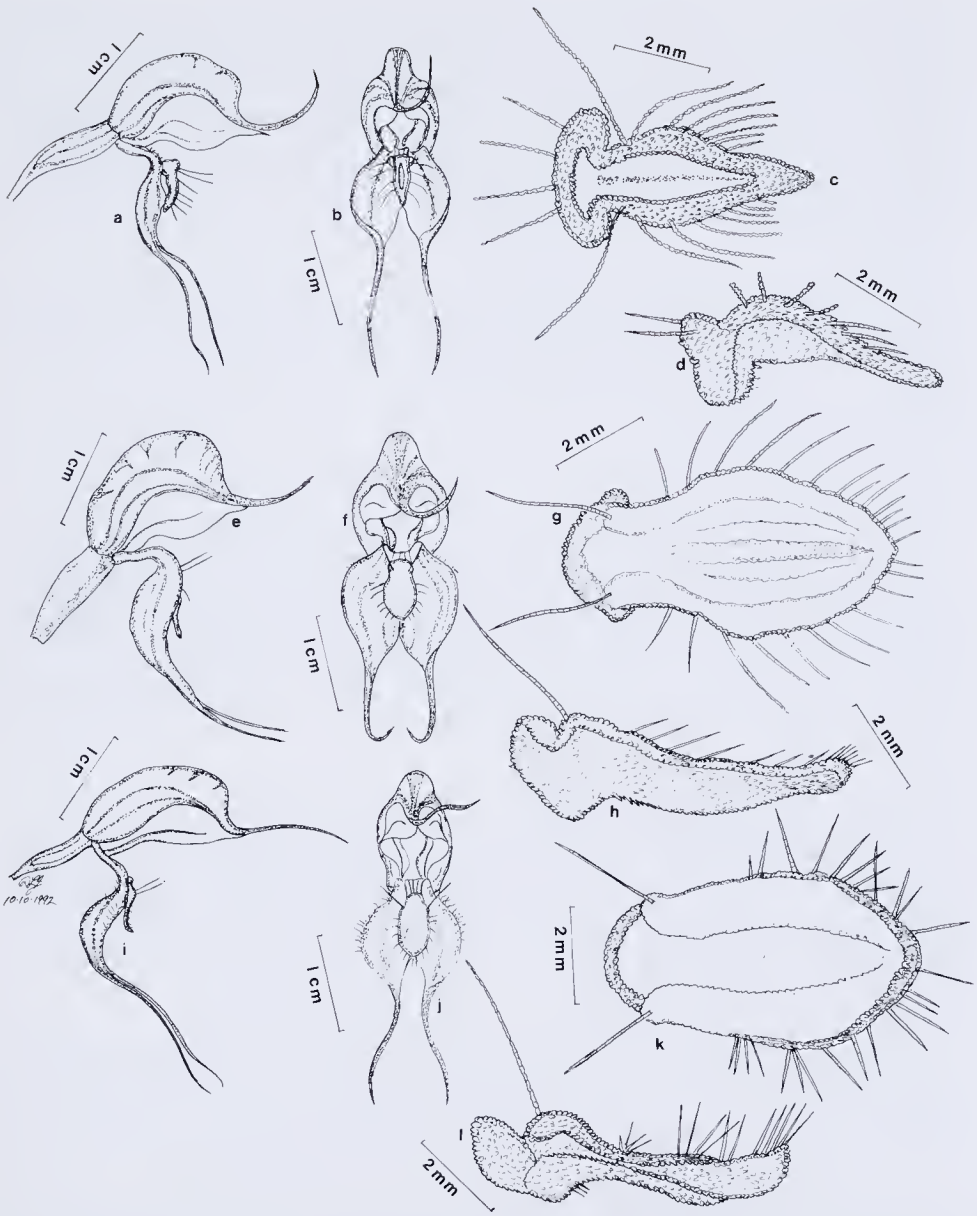

Fig. 2. a–d *Pterostylis basaltica* a — flower from side. b — flower from front. c — labellum flattened out, from above. d — labellum from side. (drawn from the type collection).
e–h *Pterostylis cheraphila* e — flower from side. f — flower from front. g — labellum flattened out, from above. h — labellum from side. (drawn from the type collection).
i–l *Pterostylis planulata* i — flower from side. j — flower from front. k — labellum flattened out, from above. l — labellum from side. (drawn from the type collection).

10–23 mm long, filamentous, more or less parallel. *Petals* ovate-lanceolate, 14–18 mm × 5–6 mm, acuminate, transparent with brown lines, dorsal ridge with numerous trichomes, proximal flange poorly developed. *Labellum* obovate-elliptical, 6–7 mm × 3–3.5 mm, dark brown, thin textured, constricted in proximal quarter, widest near the middle, margins irregularly scalloped, apex obtuse; lateral margins

with 9–12 pairs of stiff white, spreading trichomes *c.* 1.5 mm long; basal lobe raised, sloping backwards, a pair of prominent erect trichomes *c.* 3 mm long arising near the constriction; underside with a narrow, deep, central channel extending nearly to the apex, bordered by a band of pale siliceous cells. *Column* 16–18 mm long, curved. *Column wings c.* 4 mm × 3 mm, more or less rectangular, anterior margins incurved, ciliate, barrier cilia moniliform, entire. *Stigma* 6–7 mm × *c.* 2.5 mm, narrowly elliptical, margins more or less undulate. *Anther c.* 1.5 mm long, obtuse. *Pollinia c.* 2 mm long, linear-clavate, yellow, mealy. *Capsule* not seen. (Fig. 2 e-h)

Distribution and Habitat

Apparently endemic to north-western Victoria growing along the banks of the Wimmera River in riverine woodland dominated by *Eucalyptus largiflorens*. The soil is a cracking grey clay to silty clay.

Flowering Period

October and November.

Notes

This species has many similarities to *P. maxima* M. Clements and D. Jones. It can be distinguished from that species by its shorter, narrower rosette leaves, smaller, glossy brown flowers and a smaller, narrower labellum. The habitat occupied by each species is very different. Whereas *P. maxima* grows in well-drained, often stony soils in open forest and mallee scrub, *P. cheraphila* by comparison is found in riverine forest in heavy textured clays and silty clays. These sites are within the floodplain of the river and whole colonies of this orchid become submerged at peak floods. This is a most unusual habitat for a representative of this group of orchids.

Conservation Status

Although locally common this species is very restricted in distribution and is conserved in a National Park; suggest 2RC according to Briggs and Leigh (1989).

Etymology

From the Greek *cheras*, alluvium, silt, detritus, *philo*, loving; in reference to the silty soils where the species grows.

Pterostylis chlorogramma D. Jones *et* M. Clements *species nova*

affinis *P. longifoliae* R. Br. sed planta robustiore; floribus majoribus distincte vittatis; petalorum jugis marginalibus ad basin galeae prominentibus; et labello majore smaragdino, lobo basali truncato.

Typus: Victoria; near Grantville, 38°24′S, 145°32′E, 21 August 1991, *G. Glare s. n.* (*D. L. Jones 7585*) (Holotypus: CBG; Isotypi: CBG, MEL).

Terrestrial tuberous herb. Rosette a separate plant, on a slender stalk 2–6.5 cm tall; leaves 3–6, 10–23 mm × 3–5 mm, linear-lanceolate to narrow-ovate, dark green above, smooth and paler beneath acute, sessile or shortly petiolate. *Flowering plants* 20–45 cm tall. *Stem leaves* 5–9, 2–6 cm × 3–6 mm, linear-lanceolate to lanceolate, sessile, obliquely erect to spreading, dark green above, paler beneath, margins recurved, apex acute, sheathing at the base. *Floral bracts* 8–14 mm × 4–7 mm, ovate, acuminate, closely sheathing. *Pedicel* 8–20 mm long, straight. *Ovary* 5–6 mm long, dark green, smooth to slightly verrucose. *Flowers* 1–7, 15–18 mm long, obliquely erect, pale translucent green with darker green stripes, somewhat shiny; galea curved throughout, curving downwards from above the middle and then suddenly near the apex; petals with broad proximal flanges which block off the base of the galea. *Dorsal sepal* 15–18 mm × c. 10 mm, more or less ovate, inflated in the proximal half then tapered to the apex; apical point c. 1 mm long,

brownish. *Lateral sepals* deflexed, oblong, 13–16 mm × 6–7 mm, slightly curved forwards near the apex, inner surface minutely scabrous; sinus narrow, lobes divergent; free points 4–5 mm long, 5–6 mm apart at the apex, green or brownish. *Petals* 14–16 mm × 2.5–3 mm, slightly falcate; central ridge prominent; proximal posterior flange *c.* 2 mm across, well-developed, obtuse; distal posterior flange *c.* 0.5 mm wide; anterior flange 2.5–3 mm wide, transparent, margins entire. *Labellum* narrowly oblong, *c.* 7 mm × 2.5–3 mm, slightly constricted in distal third, emerald green with a dark green basal mound and central callus, rarely wholly brownish green; basal mound *c.* 2 mm thick, prominent, erect, apex truncate, covered with beaded siliceous cells; lateral lobes *c.* 5–5.5 mm long, moderately well developed, ridged and somewhat spreading in the distal half, covered with beaded, siliceous cells, a few protruding clear, acicular cells to 0.3 mm long on the proximal margins; mid-lobe *c.* 1.7 mm long, the apex strongly upcurved, pale green, covered with beaded siliceous cells, densely margined with clear, short acicular cells; apex notched for *c.* 0.5 mm, the lobes divergent. *Column c.* 14 mm long, curved, green. *Column wings c.* 3 mm × 3 mm, more or less rectangular, anterior margins incurved, with numerous flat cilia *c.* 1 mm long; upper lobe *c.* 0.6 mm long, ovoid, obtuse. *Stigma c.* 6 mm × 1.8 mm, narrow-elliptical, apex broadly notched, distal margins crenulate. *Anther c.* 1.4 mm long, shortly rostrate. *Pollinia c.* 1.8 mm long, linear-oblong, yellow, mealy. *Capsule* not seen. (Fig. 1 j-m)

Distribution and Habitat

Apparently endemic to south-eastern Victoria. Grows in moist open forest among herbs and shrubs in shallow, grey-brown clay loams.

Flowering Period

July to September.

Notes

P. chlorogramma has affinities with *P. smaragdyna* D. Jones & M. Clements but has smaller, narrower flowers which are much paler with prominent dark green stripes. It also has narrowly oblong lateral sepals and a smaller, narrower labellum with smaller, less protruding lateral lobes. These differences become obvious when flattened labella of the two taxa are compared (see Fig. 1). *P. chlorogramma* can be distinguished readily from *P. longifolia* R. Br. by its much larger flowers, petals with prominent flanges which block off the base of the galea and a much larger, emerald green labellum.

Conservation Status

Apparently of restricted distribution and uncommon to rare. Known to be conserved in Wilson's Promontory National Park but threatened by gravel extraction activities at other sites (G. Glare pers. comm.). Suggest status of 3VC by criteria of Briggs & Leigh (1989).

Etymology

From the Greek, *chloros*, green, *gramme*, line; in reference to the prominent green lines on the flowers.

Pterostylis petrosa D. Jones *et* M. Clements *species nova*

affinis *P. bisetae* Blackmore et Clemesha sed planta multo breviore; galea latiore; sepalorum apicibus brevioribus filamentosis; sepalis lateralibus latioribus; petalis majoribus; et labello longiore angustiore elliptico ad paene oblongo.

Typus: New South Wales; The Rock, 35°16′S, 147°07′E, 7 December 1988, *A.E. Logan s.n.* (Holotypus: CBG; Isotypi: CBG, NSW).

Solitary, tuberous, terrestrial herb. Leaves narrowly elliptical to narrowly obovate, 15–25 mm × 6–9 mm, sessile to subsessile, obtuse to subacute, 6–10 in a

sparse radical rosette, usually senescent at flowering. *Scape* 9–15 cm tall, slender to moderately stout, with 2–4 closely sheathing, ovate-lanceolate, acute to acuminate stem leaves. *Floral bracts* 10–23 mm long, ovate-lanceolate, closely sheathing, acute to acuminate. *Pedicels* 14–20 mm long, slender. *Ovary* 8–10 mm long. *Flowers* 1–8, transparent with broad brown lines and reddish brown patches in the galea and sepals, porrect; galea gibbous at the base, shallowly curved, decurved suddenly to the apex; proximal petal flanges widely separated and not closing off the base of the galea. *Dorsal sepal* 18–20 mm long, cucullate, obliquely erect, abruptly decurved in distal third, reddish brown with darker lines and transparent areas, apical point 8–10 mm long, filiform, long acuminate, porrect to upcurved. *Lateral sepals* deflexed, reddish brown with darker lines and transparent areas; conjoined part deeply concave, 6–8 mm × 14–16 mm, the margins thickened and slightly incurved with numerous white trichomes *c.* 1 mm long; sinus narrow, the lobes divergent; free points 14–20 mm long, filamentous, more or less parallel. *Petals* ovate-lanceolate, 16–19 mm × 5–6 mm, long-acuminate, curved at the base, transparent with red-brown lines, dorsal ridge with numerous trichomes, proximal flange poorly developed. *Labellum* highly irritable on a curved claw *c.* 3.5 mm long; lamina oblong-elliptical, 7–9 mm × 3–3.5 mm, brown, thin-textured, constricted in proximal third, widest above the middle, margins irregularly scalloped, apex broadly obtuse; lateral margins with 9–12 pairs of stiff, white, spreading trichomes *c.* 1.2 mm long; basal lobe slightly raised, sloped backwards, a pair of prominent, erect trichomes *c.* 3 mm long arising near the constriction; underside with a narrow, deep, central channel extending nearly to the apex, bordered by a band of pale, siliceous cells. *Column* 17–19 mm long, more or less straight. *Column wings c.* 4 mm × 3 mm, more or less rectangular, anterior margins incurved, ciliate; barrier cilia moniliform, entire. *Stigma* 8–10 mm × *c.* 3 mm, oblong-elliptical, margins irregularly crenate. *Anther c.* 1.2 mm long, obtuse. *Pollinia c.* 2 mm long, linear, yellow, mealy. *Capsule* not seen. (Fig. 3)

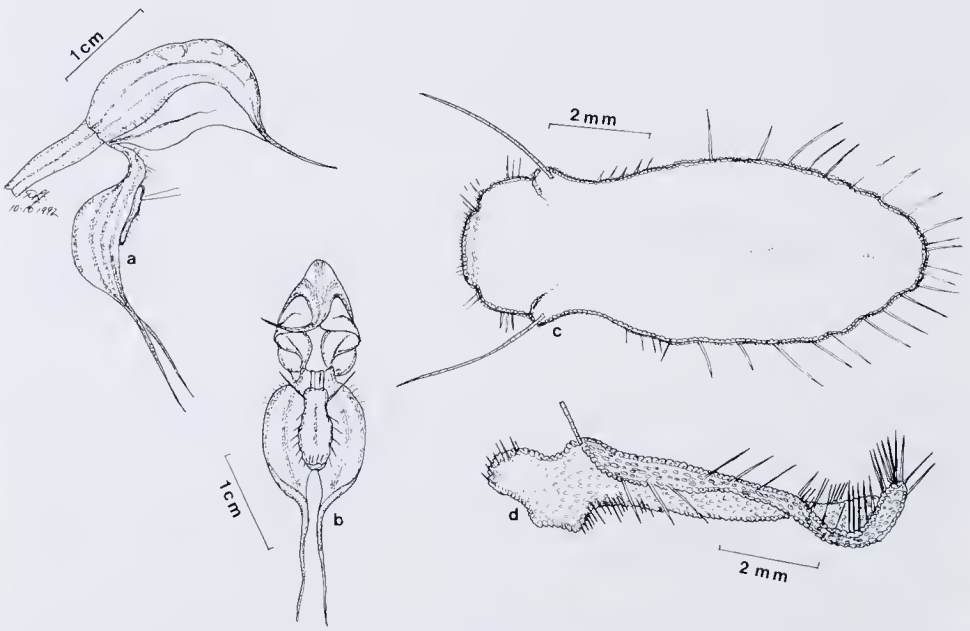

Fig. 3. *Pterostylis petrosa* . a — flower from side. b — flower from front. c — labellum flattened out, from above. d — labellum from side. (drawn from *M. A. Clements 4066*)

Distribution and Habitat

Apparently endemic to southern New South Wales where it occurs on disjunct rock outcrops in the Riverina District. It grows in sandy loams in rock crevices and ledges under sparse forest.

Flowering Period

September to November.

Notes

This species, part of a complex around *P. biseta* Blackmore and Clemesha, can be distinguished by its shorter growing habit, wider galea, shorter free points on the sepals, larger petals and a longer, oblong-elliptical to elliptical labellum.

Conservation Status

Of restricted distribution but conserved; suggest 2EC by criteria of Briggs and Leigh (1989).

Etymology

From the Greek *petrosa*, rocky, stony; in reference to the habitat and also an oblique reference to the type locality.

Pterostylis planulata D.Jones *et* M. Clements *species nova*

affinis *P. bisetae* Blackmore et Clemesha sed planta multo graciliore floribus minoribus viridibus; labello oblongo-ovoideo ad oblongo-obovoideo viride ad basin minus constricto; et sepalis ubi unitis vadose concavis vel fere planis.

Typus: Victoria; Mt. Zero, northern end of the Grampians, 36°54′S, 142°22′E, 26 November 1991, *P. Branwhite s.n.* (*D.L. Jones 8591*) (Holotypus: CBG; Isotypi: CBG, MEL).

Solitary, tuberous, terrestrial herb. Leaves 18–30 mm × 4.5–8 mm, linear-elliptical to linear-ovate, sessile to subsessile, subacute to acute, 5–8 in a sparse radical stem-encircling rosette, usually senescent at flowering. *Scape* 10–20 cm tall, slender, with 3 or 4 closely sheathing, ovate to lanceolate, acute to acuminate stem leaves. *Pedicels* 10–24 mm long, slender. *Ovary* 5–7 mm long. *Flowers* 1–7, transparent with green darker green lines and patches in the galea, porrect; galea gibbous at the base, more or less gently curved, decurved suddenly to the apex; proximal petal flanges nearly closing off the base of the galea. *Dorsal sepal* 12–15 mm long, cucullate, obliquely erect, abruptly decurved in distal quarter, green with dark green lines and transparent areas, apical point 20–30 mm long, filiform, long acuminate, porrect to decurved. *Lateral sepals* deflexed, green with dark green lines and transparent areas; conjoined part very shallowly concave to almost flat, 6–8 mm × 4–5 mm, the margins slightly incurved, with numerous white trichomes *c.* 1 mm long; sinus narrow, the lobes divergent; free points 20–35 mm long, filamentous, more or less parallel. *Petals* obovate-lanceolate, 14–17 mm × 5–6 mm, acuminate, curved at the base, transparent with green lines, dorsal ridge with numerous trichomes, proximal flange poorly developed. *Labellum* highly irritable on a curved claw *c.* 3.3 mm long; lamina oblong-ovate to oblong-obovate, 5.5–7 mm × 3–3.5 mm, dark green, thin textured, barely constricted in distal quarter, widest above the middle, margins irregularly undulate, apex upcurved to cymbiform; lateral margins with 9–12 pairs of short stiff white spreading trichomes c. 1mm long; basal lobe raised, sloped backwards, a pair of prominent, erect trichomes *c.* 3 mm long arising from a swollen area near the constriction; underside with a broad, shallow central channel extending nearly to the apex, bordered by a band of siliceous cells. *Column* 13–16 mm long, strongly curved in distal third. *Column wings c.* 4 mm × 3 mm, more or less rectangular, anterior margins incurved, ciliate; barrier cilia maniliform, entire. *Stigma* 6–7 mm × *c.* 2 mm, narrowly elliptical, upper margins irregularly toothed. *Anther c.* 1.3 mm long,

obtuse. *Pollinia c.* 1.6 mm long, linear-clavate, yellow, mealy. *Capsule* not seen. (Fig. 2 i-l)

Distribution and Habitat

Endemic to south-western Victoria where occuring on the northern outliers of the Grampians. Grows in shallow grey sand on sandstone rock ledges and in crevices in the scant protection of low shrubs.

Flowering Period

October and November.

Notes

P. planulata is part of a complex of taxa surrounding *P. biseta* Blackmore and Clemesha. It can be distinguished from *P. biseta* by its more slender habit and smaller green flowers, with an oblong-ovate to oblong-obovate green labellum which is scarcely constricted at the base. The conjoined part of the lateral sepals, being shallowly concave to nearly flat, is also very distinctive.

Conservation Status

Apparently of restricted distribution and uncommon to rare, although conserved; suggest 2RC according to Briggs and Leigh (1989).

Etymology

From the Latin *planus*, even flat, level; in reference to the shallowly concave to nearly flat lateral sepals.

Pterostylis smaragdyna D. Jones *et* M. Clements *species nova*

affinis *P. longifoliae* R. Br. a qua floribus majoribus, petalis base umbonato prominenti basem galeae obstructenti, et labello permajore, smaragdyno differt.

Typus: Victoria; Ironbark Rd, Diamond Creek, 37°41′S, 145°10′E, 9 July 1987, *H.M.E. Richards 201* (Holotypus: CBG; Isotypi: CBG, MEL).

Terrestrial tuberous herb. Rosette a separate plant, on a slender stalk 2–5 cm tall; leaves 3–5, linear-lanceolate to narrow-ovate, 9–35 mm × 4–8 mm, dark green above, smooth and paler beneath acute sessile or shortly petiolate. *Flowering plants* 9–55 cm tall. *Stem leaves* 5–7, 2–10 cm × 3–6 mm, linear-lanceolate to lanceolate, sessile, obliquely erect, dark green above, paler beneath, margins recurved, apex acute, sheathing at the base. *Floral bracts* 10–17 mm × 4–8 mm, ovate, acuminate, closely sheathing. *Pedicel* 5–20 mm long, straight. *Ovary* 6–7 mm long, dark green, smooth to slightly verrucose. *Flowers* 1–10, 17–22 mm long, obliquely erect, translucent green with darker green stripes and suffusions, somewhat shiny; galea curved throughout, curving downwards from near the middle and then suddenly near the apex; petals with broad proximal flanges which block off the base of the galea. *Dorsal sepal* 18–22 mm × 12 mm, more or less ovate, broadly inflated in the proximal half then tapered to apex, apical point *c.* 1 mm long, brownish. *Lateral sepals* deflexed, narrowly-elliptical, 16–19 mm × 7–8 mm, slightly curved forwards near the apex, inner surface minutely scabrous; sinus narrow, lobes divergent; free points 6–7 mm long, 4–5 mm apart at the apex, green or brownish. *Petals* 15–16 mm × *c.* 4 mm, slightly falcate; central ridge prominent; proximal posterior flange *c.* 2 mm across, well-developed, obtuse; distal posterior flange *c.* 0.5 mm wide; anterior flange 2.5–3 mm wide, transparent, acute margins entire. *Labellum c.* 8 mm × 4 mm, more or less oblong, emerald green with a dark green basal mound and central callus, mid-lobe paler; basal mound *c.* 2.5 mm thick, prominent, erect, apex obtuse covered with beaded siliceous cells and very short clear, acicular cells; lateral lobes 6–6.5 mm long, well developed, ridged and widely spreading in the distal half, covered with beaded, siiceous cells, numerous protruding clear, acicular cells to 0.3 mm long on the proximal margins; mid-lobe

c. 2 mm long, the apex strongly upcurved, pale green, covered with beaded siliceous cells, densely margined with clear, short acicular cells; apex notched for *c.* 0.5 mm, the lobes divergent. *Column c.* 15 mm long, curved, green. *Column wings c.* 4 mm × 4 mm, more or less rectangular, anterior margins incurved, with numerous flat cilia *c.* 1mm long; distal lobe *c.* 0.6 mm long, ovoid, obtuse. *Stigma c.* 7 mm × 2 mm, elliptical-cordate, apex broadly notched, distal margins crenulate. *Anther c.* 1.4 mm long, shortly rostrate. *Pollinia c.* 1.5 mm long, linear-oblong, yellow, mealy. *Capsule* 12–14 mm × 3–4 mm, obovoid. (Fig. 2 f-i)

Distribution and Habitat

Apparently endemic to central Victoria. Grows in moist flat areas among grass in open forest and also on dry ridges.

Flowering Period

July and August.

Notes

P. smaragdyna has affinities with *P. longifolia* R. Br. but has much larger flowers, petals with prominent proximal flanges which block off the base of the galea and a much larger labellum, which is usually emerald green but is occasionally brownish green. Sporadic hybrids occur where both species grow in close proximity at Diamond Creek. *P smaragdyna* is also similar to *P. chlorogramma* but has much larger, broader flowers and a larger labellum with widely spreading lateral lobes.

Conservation Status

Moderately widespread and conserved in the Brisbane Ranges National Park. Suggest status of 3RC by criteria of Briggs & Leigh (1989).

Etymology

From the Latin *smaragdinus*, emerald green, in reference to the colour of the labellum.

ACKNOWLEDGEMENTS

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NEW AUSTRALIAN SPECIES OF *TRIGLOCHIN* L. (JUNCAGINACEAE) FORMERLY INCLUDED IN *T. PROCERUM* R. Br.

HELEN I. ASTON*

ABSTRACT

Aston, H.I. New Australian species of *Triglochin* L. (Juncaginaceae) formerly included in *T. procerum* R. Br. **Muelleria 8(1): 85–97 (1993).** — *Triglochin alcockiae*, *Triglochin microtuberosum*, *Triglochin multifructum* and *Triglochin rheophilum* are described as new species from eastern Australia. Notes on diagnostic features, geographical distribution and habitat preferences accompany each description. Maps are included.

INTRODUCTION

This paper is a precursor to a full revision of the tuberous-rooted species of *Triglochin* L. found within Australia. It is published now in order to make the new names available in time for the forthcoming 'Flora of Victoria'.

The descriptions are presented in the same format to be used for other species in the full revision. This will allow direct comparison between all species. The revision will include further discussion of the details given here.

Triglochin L. has been treated by different authors as either feminine or neuter but Rauschert (1974) argued that it should correctly be accepted as neuter. Dr L.A.S. Johnson (*in litt.*) has assured me that Rauschert's argument is sound. The spelling *Triglochin procera* is therefore correctly *Triglochin procerum* and other epithet endings follow suit.

TAXONOMY

Triglochin alcockiae H.I. Aston *sp. nov.*

Triglochin procerum 'S-w Vic', Aston *in litt.*

> *T. procero* R.Br. tuberibus parvioribus, 1–3plo tantum longioribus quam latioribus, fructibus paucioribus typice latioribus quam longioribus, marginibus ventralibus carpellorum fructicantium affixis non nisi secus infernum 20%-39% longitudinem carpelli distinguitur.

TYPUS: Victoria, *c.* 38 km (straight line) south-west of Horsham. Swamp at north end of Toolondo Reservoir. 36° 59′S, 141° 56′E. Common in still, tannin-stained to clear fresh water few-30 cm deep. 9 Nov. 1988, *H.I. Aston 2705* (HOLOTYPUS: MEL 705957; ISOTYPI: AD, BRI, CANB, CBG, HO, K, MEL 705956 & 705962 & 705963 & spirit material, NSW, PERTH).

Rhizomes vertical, 1.7–7 cm long × 7–10 mm diam., bearing short fine soft fibres to 2 cm long, rarely to 11 cm. *Tubers* ellipsoid, obloid or globular to oblanceolate or obovate, 8–20(-28) mm long × 5–12 mm diam. (length 1.0–3.0 times the diam.), terminating roots 5–35 mm long; each root 0.3–2.3 times as long as its tuber. *Leaves* (6-)26–91 cm long × (1-) 2–8 mm wide, dorsiventral, medium-green and glossy above, paler beneath, bending below the water surface, the emerged portions floating and maintaining contact with the water along their whole length (or sometimes held semi-erect by surrounding herbage), ± linear, flat to slightly plano-convex in T.S., shortly tapered, obtuse, moderately thickened and spongy toward the base, sheathed over the lower 16%–38% of the leaf length. *T.S. leaf about 3 cm below the sheath summit*: narrowly plano- to concavo-convex, width 3.8–4.3 times the thickness; each side of sheath 2.1–2.6 mm wide, equal *c.* 34%–45% of the leaf width. *Stems* in fruit 28–81 cm long (including the infructescence)

* c/o National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

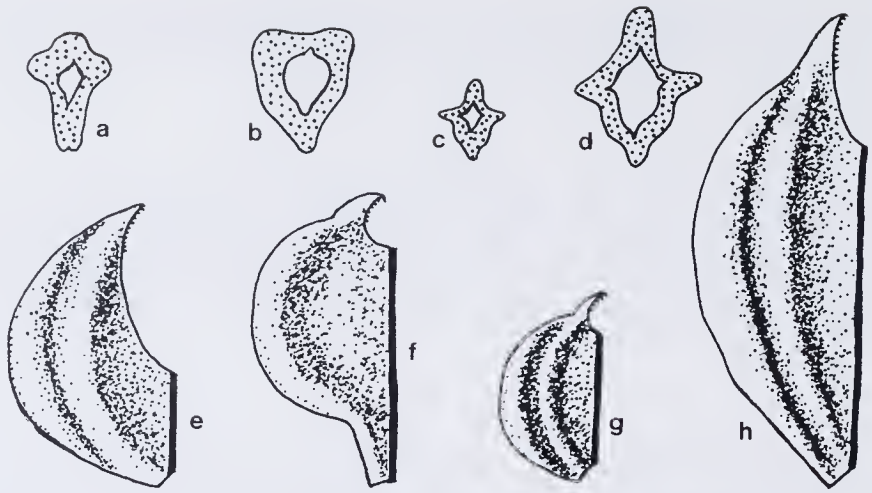

Fig. 1. Mature fruiting carpels of *Triglochin* spp. a–d — outline in T.S., dorsal surface at top. e–h — lateral view, dorsal surface to left, ventral attachment shown by thickened line at right. — a & e, *T. alcockiae*, from *Aston 2722* (MEL). b & f, *T. microtuberosum*, from *Aston 2683* (MEL). c & g, *T. multifructum*, from *Aston 2797* (MEL). d & h, *T. rheophilum*, from *Clarke 1934* (MEL). All × 5.

× 1.3–5.9 mm diameter. *Rachis* 1.0–2.6 mm diam. at base, gradually tapered upwards; rachis and pedicels pale cream-green or the rachis (occasionally also the pedicels) pale to deep maroon-red. *Infructescence* (0.6-)2–13.5 cm long (= 5%–28% of the total stem length) × 11–19 mm diameter. *Pedicels* often upcurved, 1.2–3.5 mm long. *Fruits* loosely touching to shortly spaced, (1-)8–67 per infructescence, 3–8 per 1 cm of rachis length, globular to depressed globular in outline, usually broader than long, 5.6–8.7 mm long × 6.6–9.9 mm diameter. *Carpels* (5 or) 6, in fruit straight and erect or the upper portions partly spiralled around each other and then giving a semi-twisted appearance to the fruit, all maturing or 1 or 2 (occasionally to 5) aborted, 5.6–8.5 mm long × 1.3–3.0 mm wide × 2.3–4.1 mm deep; ventral edges attached only over the lower portions; attachment length = 20%–39% of the carpel length; lateral faces ± flat to slightly concave or convex, mostly not adpressed; dorsal ridge broad-rounded, 10%–22% of carpel depth; shoulder ridges rounded, 17%–26% of carpel width. (Fig. 1 a & e)

Selected Specimens Examined (total examined = 70)

South Australia — Bangham area, 23 Oct. 1988, *Alcock s.n.* (MEL); 1 km N of Pages Flat Road, Southern Lofty Ranges, 10 Oct. 1977, *Bell 327* (AD); Section 66, Hundred of Townsend, 24 Oct. 1981, *Conrick 683* (AD); Comaum, *c.* 40 km SSE of Naracoorte, 21 Oct. 1962, *Hunt 1255* (AD); Kelly Hill, *c.* 13 km ENE of Cape du Couedic, Kangaroo Island, 7 Nov. 1958, *Wilson 787* (AD; also AK, BISH, UC *n.v.*).

Victoria — Mundarra, *c.* 11 km WSW of Edenhope, 11 Nov. 1988, *Aston 2720* (AD, MEL, NSW); Swamp beside the Glenelg River, 2.4 km E of Dergholm, 12 Nov. 1988, *Aston 2724* (AD, MEL, NSW); Coleraine racetrack, *c.* 4 km E of centre of Coleraine town, 12 Nov. 1988, *Aston 2726* (MEL); 1.75 km W of Bay of Martyrs carpark, *c.* 2 km W of Peterborough, 2 Jan. 1992, *Carr 11680* (AD, BRI, CANB, HO, K, MEL, NSW).

Tasmania — Near Longford, 19 Nov. 1951, *Barber s.n.* (HO); Melaleuca Creek, Bathurst Harbour, 23 Jan. 1979, *Chandler s.n.* (MEL); 1.5 km W of Cape Naturaliste, 14 Oct. 1983, *Moscal 3493* (HO, MEL); Hardwickes Hill, 24 Nov. 1983, *Moscal 4438* (HO, also AD *n.v.*); Wanderer River, 9 Mar. 1985, *Moscal 10131* (HO).

Distribution (Fig. 2)

Occurs in South Australia on Kangaroo Island and in the Southern Lofty and south-eastern regions, extending into south-western Victoria south-west of

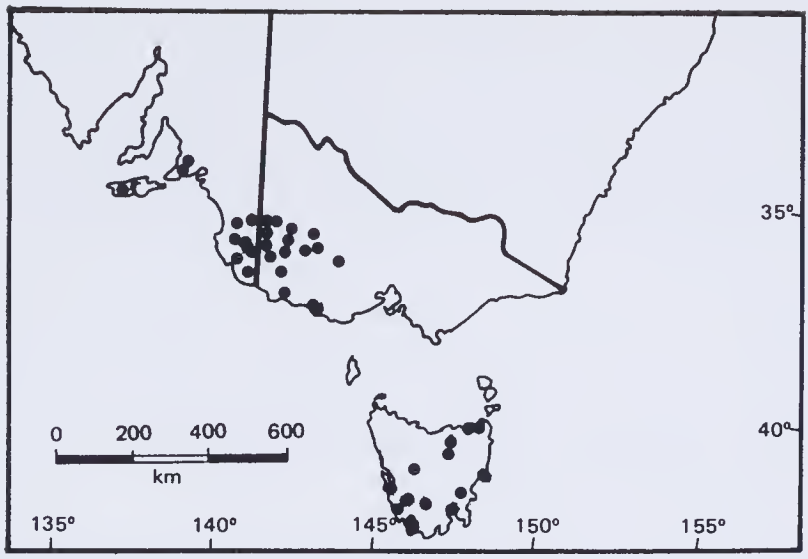

Fig. 2. Distribution map of *Triglochin alcockiae*.

approximately the Little Desert, Stawell and Port Campbell. Also widespread in central, eastern and southern Tasmania.

Habitat

Usually fresh, still, clear water to 30(–50) cm deep in ephemeral swamps, pools and swampy flats; occasionally edging small streams or in tannin-stained or stagnant water. Occasionally in brackish water of coastal swamp (*Carr 1168*) or tidal stream (*Moscal 10131*). Substrate fine, often humic, sand, silt, sandy-loam or sandy-clay, generally over fine sticky grey or black clay; a stony alluvial stream bank also recorded. Swamps typically in *Eucalyptus camaldulensis* (River Red Gum) or *E. baxteri* (Brown Stringybark) open forest, heathland, or open grassy pastureland. *Triglochin alcockiae* often co-exists within dense assemblages of sedges and aquatic or semi-aquatic herbs, e.g. *Baumea juncea*, *B. tetragona*, *Carex* sp., *Chorizandra cymbaria*, *Schoenus tesquorum*, *Scirpus fluitans*, *Craspedia* sp., *Hypolaena longissima*, *Isoetes* sp., *Leptocarpus brownii*, *Liliaeopsis* sp., *Milligania johnstonii*, *Myriophyllum muelleri*, *M. salsugineum*, *Neopaxia australasica*, *Potamogeton tricarinatus*, *Selliera radicans*, *Stellaria* sp., *Swainsona procumbens*, *Ranunculus robertsonii*, *Triglochin striatum*, *T. turriferum*, *Villarsia reniformis*.

Commonly occurs from virtually sea level to 200 m altitude, but recorded up to *c.* 300 m on the mainland (Grampians and Southern Lofty areas) and up to *c.* 750 m in Tasmania.

Flowers from September to December on the mainland; September to March in Tasmania. Fruits from (September-) October to December (–January) in Victoria and South Australia; October to March in Tasmania.

Diagnosis and Etymology

Triglochin alcockiae is a comparatively small and slender species with distinctive fruits and partially distinctive tubers. Mature fruits are comparatively few, 1–67 per infructescence, to 8.7 mm long and 9.9 mm diam., usually somewhat broader than long, globular to depressed-globular in outline with rounded dorsal ridges. Fruiting carpels are ventrally attached only over the lower 20%–39% of the carpel length. The free upper portion of the carpels may be partially

spiralled around each other. Of the (5 or) 6 carpels in the developing fruit all may mature or frequently 1 or 2, sometimes more, may abort.

Tubers are distinctively smaller and plumper than those of the sympatric *T. procerum* but can resemble those of some of the allopatric species of *Triglochin*.

The specific epithet *alcockiae* commemorates Mrs Kath Alcock of Naracoorte (formerly of Comaum), South Australia. Mrs Alcock has displayed a deep interest in the plants of her area over many years and was the first to alert me to the existence of this species.

FIELD OBSERVATIONS

Triglochin alcockiae has been observed (*Aston 2724*) in the field growing intermingled with *Triglochin procerum* (*Aston 2725*). Plants of each species exhibited distinctive differences in fruits, tubers and racemes, with no gradations.

Triglochin microtuberosum H.I. Aston *sp.nov.*

Triglochin procerum agg., form B, Robb & Ladiges (1981).

Triglochin procerum 'B', Aston *in litt.*

Triglochin procero R. Br. tuberibus parvis prope rhizomate fasciculatis, fructibus pyriformibus plus minusve, et carpellis fructicantibus sine cristis dorsalibus distinguitur.

TYPUS: Victoria, East Gippsland, 'Redbanks' farm, *c.* 2 km south-east of Genoa, 37°28′S, 149°36′E. Abundant in stagnant waterhole of an otherwise-dry creek in cleared grazing country. Water highly eutrophic, muddy, with much farm run-off and cow-dung from cattle which have eaten the *Triglochin* and trampled the substrate. 23 Feb. 1988, *H.I. Aston 2683* (HOLOTYPUS: MEL 705958; ISOTYPI: AD, BRI, CANB, MEL 705961 & spirit material, NSW).

Rhizomes horizontal, to 7 cm long × 6–12 mm diam., bearing short coarse bristly fibres to 12 mm long. *Tubers* near-globular to obloid or rarely obovoid, 4.5–13(–17) mm long × 3–6 mm diam. (length 1.1–1.9(–5) times the diam.), terminating roots 1–7(–14) mm long; each root 0.2–2 times as long as its tuber (see under Notes below re abnormal tubers). *Leaves* 30–137 cm long × 3–12 mm wide, dorsiventral, deep green above, paler green beneath, emergent, erect or with the extremities outcurved, sometimes the emerged portion fully floating or recurved with only the extremity floating, tapered and flattened distally, acute, very thickened and spongy toward the base, sheathed over the lower 27%–49% of the leaf length. *T.S. leaf about 3 cm below the sheath summit*: broadly plano- to concavo-convex and ± semi-cylindrical, width 1.6–2.4 times the thickness; each side of sheath 3.4–9.0 mm wide, equal *c.* 50%–84% of the leaf width, the two sheaths usually touching to overlapping; blade and sheaths together ± rounded in outline. *Stems* in fruit 54–124 cm long (including the infructescence) × 2.5–12.6 mm diameter. *Rachis* 1.5–4.0 mm diam. at base, gradually tapered upwards; rachis and pedicels green. *Infructescence* 7–21 cm long (= 10%–20% of the total stem length) × 15–24 mm diameter. *Pedicels* 0.5–3.0 mm long. *Fruits* touching, 44–137 per infructescence, 7–9 per 1 cm of rachis length, very widely obovoid in outline but with the base contracted into a distinctive stalk, 7.0–9.6 mm long × 5.5–8.2 mm diameter. *Carpels* (5 or) 6, in fruit straight and erect, never twisted, normally all maturing, 7.0–9.6 mm long × 2.25–3.35 mm wide × 2.6–3.75 mm deep; ventral edges attached along their whole length (excluding the beak sinus); attachment length = 58%–70% of carpel length; lateral faces ± flat, adpressed; dorsal ridge absent, the dorsal face usually shallowly concave longitudinally or sometimes shallowly convex; shoulders rounded not ridged; carpel ± triangular in cross section. (Fig. 1 b & f)

Selected Specimens Examined (total examined = 32)

Queensland — Between Tamborine Village and Canungra, 27 Aug. 1961, *Blake 21593* (BRI, CBG, DNA, NSW); Serpentine Creek and environs, *c.* 11 km NE of Brisbane, Nov. 1972, *Durrington 531* (BRI).

New South Wales — About 2 km N of Carmichaels Creek, between Clarence Town and Morpeth, 28 Nov. 1989, *Aston 2791* (MEL, NSW); Creek flowing into SW side of Betunga/Penooka swamplands, *c.* 9 km SE of Bega, 13 Feb. 1990, *Aston 2813* (BRI, CANB, MEL, NSW); 200 m S of the Tuross River where crossed by the Princes Highway, 14 Feb. 1990, *Aston 2814* (BRI, CBG, MEL, NSW); Tooloom Falls, 3 miles from Urbenville, North Coast region, 4 Dec. 1970, *Telford 2699* (CBG).

Victoria — Cox's Bridge over South Gippsland Highway, *c.* 0.5 km S of Sale, 6 Apr. 1987, *Aston 2619* (HO, MEL, NSW); Bunga Creek, at Princes Highway, *c.* 5 km NE of Lakes Entrance, 7 Apr. 1987, *Aston 2639* (MEL, NSW); 'Carinya', *c.* 1 or 2 km W of Swan Reach, 9 Apr. 1987, *Aston 2650* (BRI, CANB, HO, MEL, NSW); E side of Corringle Beach Road, 0.5 km S of the Princes Highway at Newmerella, 22 Jan. 1992, *Aston 2841* (BRI, CANB, MEL).

Distribution (Fig. 3)

Common in Central and South Coast regions of New South Wales and in coastal eastern Victoria, extending from the Myall Lakes south and west to Sale. Also three disjunct records from south-east Queensland and north-east New South Wales (vicinities of Brisbane, Canungra and Urbenville).

Habitat

Fresh, usually still, sometimes gently flowing water to 50(–120) cm deep in seasonal to permanent swamps, farm dams, and small swampy creeks; stagnant water often highly eutrophic and humic with farm run-off, rotting vegetation and cattle-dung; flowing water clear. Rhizomes and roots embedded in fine black

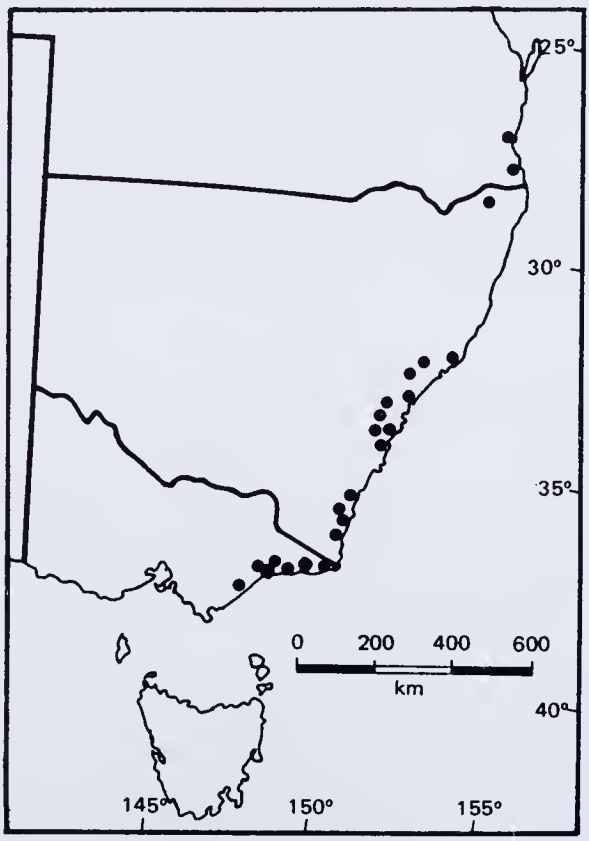

Fig. 3. Distribution map of *Triglochin microtuberosum*.

humic silt, loamy-peat, grey loam, loamy to pure or gravelly sand, gravelly-mud or (one record) clay; substrate often trampled by cattle which graze the *Triglochin*. Sites typically in cleared grassy pastures; recorded also from natural *Casuarina/Gahnia* swampland and from cleared swampland previously occupied by *Melaleuca ericifolia*. Associated species recorded are *Eleocharis sphacelata*, *Juncus* sp., *J. usitatus*, *Cyperus* sp., *C. gunnii*, *Myriophyllum* sp., *Triglochin procerum*, *Cotula coronopifolia*, *Ludwigia peploides*, *Potamogeton ochreatus*, and *Utricularia* sp.

A lowland species, mostly from *c.* 3–100 m altitude. Highest record *c.* 400 m (*Telford 2699*).

Flowers and fruits recorded all months from August to May, particularly November to April.

NOTES

When dry, the distinctive stalk of approximately the basal quarter or third of the fruit is narrowed through shrinking and may superficially be mistaken for an extension of the pedicel. The remainder of the fruit then appears depressed-globular.

Some collections (*Aston 2791, 2792*) from Morpeth, New South Wales, had unusual elongated spindle-shaped tubers to 30 mm long × 3 mm diam. on roots to 28 mm long. Other tubers and roots, and the proportions of these, agreed with the descriptions and measurements given in the main description above.

DIAGNOSIS AND ETYMOLOGY

Triglochin microtuberosum has distinctive small numerous tubers terminating very short roots so that the tubers are clustered closely against the rhizome. The more or less pear-shaped fruit with squat summit, stalk-like base and absence of dorsal ridges is also distinctive, the (5 or)6 carpels being ventrally attached over most of their length and more or less triangular in cross-section.

A helpful characteristic, although partly shared with the eastern variant of *T. procerum*, is the more or less cylindrical shape of the lower leaf as seen in cross-section below the sheath summit. Here the leaf blade is thickly spongy, i.e. the blade is deep in comparison with its width, and the sheaths are curved and usually touching to overlapping.

The epithet *microtuberosum* refers to the small clustered tubers which allow even vegetative recognition of this species.

Triglochin multifructum H.I. Aston *sp. nov.*

Triglochin procerum agg., form A, Robb & Ladiges (1981).

Triglochin procerum 'A', Aston *in litt.*

Triglochin procero R.Br. fructibus parvioribus, numerosis plus, farctis (14–27 per 1 cm rhachidis), globosis in circumferentia sed porcatis prominentibus maturitate distinguitur.

TYPUS: New South Wales, *c.* 11 km ± north-east of Barham, 35°34′01″S, 144°12′06″E. In 25 cm of slow-flowing water in small irrigation channel through open farmland. Common. <80 m altitude. 19 Apr. 1987, *H.I. Aston 2656* (HOLOTYPUS: MEL 705960; ISOTYPI: AD, BRI, CANB, MEL 705959 & spirit material, NSW).

Rhizomes horizontal to upcurved, to 11.5 cm long × 14–18 mm diam., bearing long fine soft fibres 1–6 cm long. *Tubers* narrow-ellipsoid or narrow-obovoid to ellipsoid or obovoid, rarely broad-obovoid, 13–40 mm long × 4–14 mm diam. (length 1.3–5.2 times the diam.), terminating roots (8–)20–100 mm long; each root 1–4(–5.7) times as long as its tuber. *Leaves* 43–133 cm long × 3.5–17(–34) mm wide, dorsiventral, deep green and glossy above, paler yellowish-green below, floating or sometimes with an emerged curve or with the extremities of younger shorter leaves emergent and erect, shortly tapered, obtuse-acute, thickened and spongy toward the base, sheathed over the lower 14%–20% of the leaf length. *T.S.*

leaf about 3 cm below the sheath summit: narrowly plano- to concavo-convex, width 4.3–6.5 times the thickness; each side of sheath 2–6 mm wide, equal *c.* 20%–40% of the leaf width. *Stems* in fruit 41–112(–175) cm long (including the infructescence) × 3.5–15 mm diameter. *Rachis* 2.3–5.5(–9) mm diam. at base, gradually tapered upwards; rachis and pedicels usually pale to deep maroon-cyclamen, or sometimes the rachis pale cream-green. *Infructescence* 12–36.5(–110) cm long (= 17%–46%(–63%) of the total stem length) × 10–19 mm diameter. *Pedicels* 1.1–4 mm long. *Fruits* tightly touching, 229-*c.* 1000 per infructescence, 14–27 per 1 cm of rachis length, globular in outline, 3–5 mm long × 3–5 mm diameter. *Carpels* 6(–8), straight and erect in fruit, normally all maturing, rarely 1 aborted, 3–5 mm long × 0.9–1.5 mm wide × 1.1–2.25 mm deep; ventral edges attached along their whole length (excluding the beak sinus); attachment length = 57%–75% of carpel length; lateral faces ± flat, adpressed; dorsal ridge prominent, narrow-rounded (32%–42% of carpel depth); shoulder ridges inconspicuous before carpels separate but then seen in T.S. to be 15%–28% of carpel width. See also variant description under Notes. (Fig. 1 c & g)

Selected Specimens Examined (total examined = 115)

Northern Territory — Bing Bong Station, 8 Jan. 1971, *Dunlop 2254* (DNA).

Queensland — 4.5 km E of Byfield, 4 Aug. 1985, *Anderson 4022* (BRI); Cashmere, date ?, *Armit 73* (MEL); 0.5 km N of Norman River at Normanton, 20 May 1982, *Aston 2276* (AD, BRI, MEL); 18 km N of Taroom, 7 Sep. 1983, *Aston 2497* (BRI, MEL); Kroombit Tableland, 60 km SW of Gladstone, 4 Jun. 1977, *Crisp 2784* (CBG); Coongarra Falls, Burnett District, 29 Dec. 1989, *Forster 6153* (BRI); Beerburrum Creek, *c.* 55 km N of Brisbane, 13 Nov. 1956, *Eichler 13148* (AD); 10 miles S of Mt Molloy, 1 Jul. 1962, *Hoogland 8509* (BRI, CANB); 24 km N of Mareeba, 1 May 1986, *Jacobs 4849 & Sainty* (NSW); Near Georgetown, May 1976, *Scarth-Johnson 57A* (BRI); Tambo, Barcoo River, 1874, *Dr Wuth s.n.* (MEL).

New South Wales — 7 km N of Tooleybuc, 16 Dec. 1988, *Aston 2733* (MEL, NSW, PERTH); Poisoned Waterholes Creek, 9 km SSE of Narrandera, 14 Nov. 1989, *Aston 2788* (MEL, NSW); Queanbeyan, 11 Dec. 1911, *Cambage 3349* (NSW); Joorilands, Wollondilly River, 20 Jan. 1965, *Constable 5642* (NSW); Molonglo River near Black Mountain, A.C.T., 31 Mar. 1960, *Gray 4840* (CANB); Boyd River, 15 Jan. 1977, *Jacobs 2937* (NSW); Limestone Creek, Wandsworth, 10 Jan. 1932, *McKie NSW2695* (NSW); Murie Creek, 1 km S along Wyalong road from Condoblin-Euabalong road, 28 Nov. 1983, *K.L. Wilson 5653* (NSW).

Victoria — Loch Garry, 19 km NNW of Shepparton, 17 Jan. 1987, *Aston 2611* (MEL); Wallenjoe Game Reserve, 6.5 km E of Corop, 18 Apr. 1987, *Aston 2655* (AD, BRI, MEL); 3 km NE of Wangaratta, 25 Feb. 1988, *Aston 2692* (AD, MEL); 3.5 km NNW of Piangil North, 16 Dec. 1988, *Aston 2734* (MEL); Avon River, 25 km W of St Arnaud, 19 Dec. 1988, *Aston 2746* (MEL); 3 km SSE of Wood Wood, 5 Nov. 1989, *Aston 2779* (AD, CANB, MEL).

South Australia — Neales River, Lake Eyre Basin, 28 Jan. 1978, *Knight 264* (AD); 30 km E of Macumba homestead, Lake Eyre Basin, 5 Sep. 1986, *Weber 9158* (AD).

Distribution (Fig. 4)

From the Northern Territory (one record, Gulf of Carpentaria) through eastern Queensland and New South Wales to northern Victoria, with two outlying records from the northern Lake Eyre Basin in South Australia. Most prevalent and typical in Victoria and New South Wales.

A fruiting collection (*Beauglehole 68161*, 5 Feb. 1980, MEL) from Ewing Marsh Wildlife Reserve, ± 10 km SW of Orbost, is the only definite Victorian collection of *T. multifructum* from south of the Great Dividing Range. A collection with immature fruits (*Constable 5319*, 28 Oct. 1964, NSW) from Wurruk Lagoon, Sale, is apparently this species and, if so, represents a second record from southern Victorian.

Habitat

Fresh, still to slow-flowing, usually clear water to 70 cm deep in seasonal to permanent swamps, lagoons, roadside ditches, stagnant waterholes, irrigation channels and creeks, surviving on saturated to damp soils left above receding waters. Water sometimes stained black from decomposing leaf litter of dominant trees, sometimes semi-turbid and cloudy. Rhizomes and roots embedded mostly in sandy to heavy grey clays overlain with several centimetres of soft silt, also in

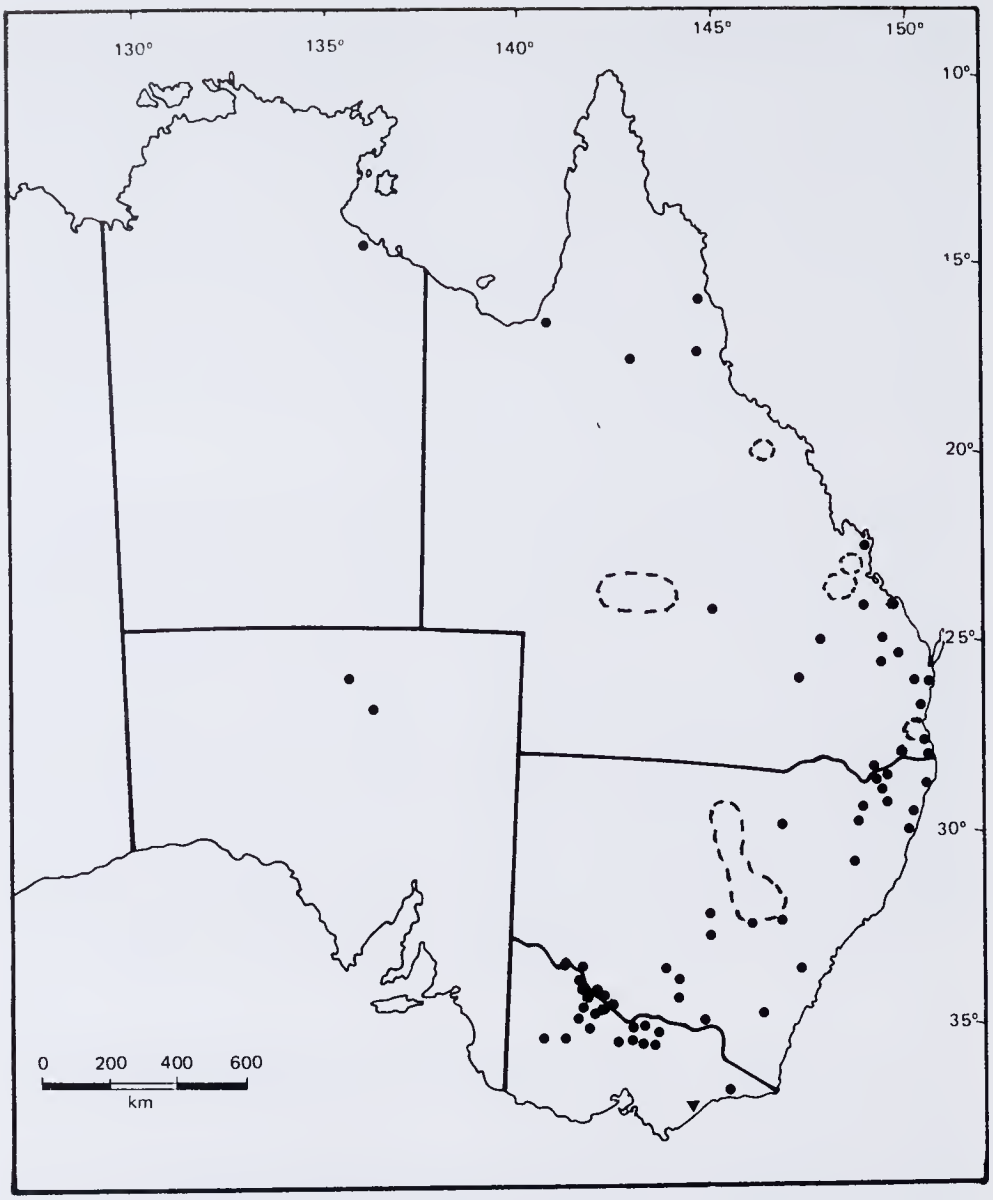

Fig. 4. Distribution map of *Triglochin multifructum*. (Triangle = a doubtful record. Dashed line = approximate position of an imprecise locality).

red-grey loamy-clay; one record (*Sharpe 1917*) in peaty soil. Sites typically in or fringed by *Eucalyptus camaldulensis* (River Red Gum) or *Melaleuca quinquinervia*; also reported in *Eucalyptus populnea* and *Eucalyptus* spp./*Casuarina littoralis* woodlands.

A lowland species usually <200 m altitude, rising to *c.* 800 m or rarely to 1050 m (Northern Tableland, N.S.W).

Flowers from August to May (Vic. and southern N.S.W.); April to September (northern tropics). Fruits from October to June (Vic. and southern N.S.W.); April to September, with one January record (northern tropics).

NOTES

Variant Description: Most collections from outside Victoria and New South Wales, including the isolated records from the Lake Eyre Basin, have fruits which are more ellipsoid and often larger than those included in the main description. In some cases they may also have narrower leaves, shorter stems in fruit, and shorter infructescences with narrower rachises. All or most of these variations may be evident on the same collection (e.g. *Armit 73*, *Hoogland 8509*, *Jacobs 4849*), but this is inconsistent. Gradients occur, and I cannot discern any consistent pattern of change, either morphologically or geographically, to indicate that any of the cllipsoid-fruited plants deserve formal taxonomic recognition.

Variant measurements which extend either the upper or lower limits given in the main description are:- Leaves 2–16 mm wide; stems in fruit 28–70 cm long (including the infructescence); rachis 1.3–4.5 mm at base; infructescences 5.7–32.7 cm long; fruits 4.5–8.5 mm long × 2.8–5 mm diameter.

DIAGNOSIS AND ETYMOLOGY

Mature fruiting plants of *T. multifructum* are readily distinguished in the field by the comparatively long slender infructescence with typically maroon-cyclamen rachis and small, numerous, tightly-touching fruits (*c.* 14–27 per 1 cm of rachis length). The small fruits (to 5 mm long) are globular in outline (more ellipsoid and to 8.5 mm long in the variant noted) but strongly ridged. The 6(–8) carpels are ventrally attached along most of their length and each has a prominent, narrow, longitudinal, dorsal ridge and two noticeable shoulder (lateral) ridges.

The specific epithet refers to the many fruits, up to *c.* 1000, which mature on each infructescence.

FIELD OBSERVATIONS

Triglochin multifructum frequently co-exists with *Triglochin procerum*, allowing plants of both species to be compared in identical environments subjected to the same water regimes. For example:

1. Near Wangaratta, in north-east Victoria, both (*Aston 2692*, *T. multifructum*; *Aston 2693*, *T. procerum*) were collected 100 m apart in the same lagoon. The leaves of both were indistinguishable in shape and growth-form except for the sheaths of *T. procerum* seeming a little wider towards the base. The mature leaves bent at the water surface to float upon it, the whole of the emerged portion of the leaf maintaining contact with the water. Only the tips of very young leaves rose above the surface. *T. multifructum* had the rachis tinged to deep maroon-cyclamen whereas the rachis of *T. procerum* was green.

2. At Wood Wood, in north-west Victoria, both grew intermingled over an extensive area and were collected (*Aston 2779*, *T. multifructum*; *Aston 2780*, *T. procerum*) from 1 m apart at identical heights above the receding water level. The structure of stems and leaves were similar on all plants in the mixed population but the stems were more slender and the leaves slightly narrower on plants of *T. multifructum*. The plants of *T. multifructum* also had tubers shorter and pro-

Table 1. Comparative tuber measurements of *Triglochin multifructum* and *T. procerum* from three populations.

Population	Species	Tuber length (mm)	Length = ? × diam.
Koondrook	*multifructum*	12–28	1.5–3
	procerum	33–56	4–9
Avon River	*multifructum*	22–30	3–4(-5)
	procerum	52–95	8–14
Wood Wood	*multifructum*	23–38	2–3
	procerum	37–55	3.5–7

portionally wider than those of *T. procerum* (Table 1), the rachis and pedicels cyclamen-maroon compared with green or sometimes tinged maroon in *T. procerum* and the fruits morphologically distinct and smaller and lighter yellow-green than the dark green to maroon-green fruits of *T. procerum*.

3. At Koondrook, northern Victoria, tubers (spirit collections *Aston 2783*, *T. multifructum*; *Aston 2784*, *T. procerum*) from plants growing 15 cm apart in an intermingled population were measured. Those from plants (*Aston 2746*, *T. multifructum*; *Aston 2747*, *T. procerum*) growing intermingled in a stagnant waterhole of the Avon River west of St Arnaud, Victoria, were also measured. Within each population, the tubers showed the same differences as those from Wood Wood mentioned above, tubers of *T. multifructum* being shorter and proportionally wider than those of *T. procerum* (Table 1).

4. At Piangil North, north-west Victoria, plants of *T. multifructum* (*Aston 2734*) and *T. procerum* (*Aston 2735*) were interspersed along the edge of a lagoon. *T. multifructum* was flowering and fruiting at the water's edge and in water to 30 cm deep whereas *T. procerum* occurred only above the waterline and had completed fruiting. This deeper water habitat and later flowering of *T. multifructum* in relation to *T. procerum* was not duplicated in observations at other locations.

Triglochin multifructum also grows intermingled with *Triglochin dubium* R. Br. Near Tooleybuc, S.W. New South Wales, the two were collected less than 1 metre apart. The pale to deep maroon-red rachis of *T. multifructum* (*Aston 2733*) contrasted with the green rachis of *T. dubium* (*Aston 2732*). Near Wallenjoe Swamp, central-northern Victoria, *T. multifructum* (*Aston 2806*) had broader obtuse more flattened leaf blades than *T. dubium* (*Aston 2807*) which had acute blades more or less semi-circular in cross section. The species could be distinguished vegetatively as well as by their strikingly different fruits.

Triglochin rheophilum H.I. Aston *sp. nov.*
Triglochin procerum agg., form D, Robb & Ladiges (1981).
Triglochin procerum 'D', Aston *in litt.*

Triglochin procero R. Br. foliis longis linearibus tenuibus neque incrassatis neque spongiosis versus basim, vaginis angustis, et fructibus cristis prominentibus, ellipsoidis vel obovatis leniter in circumferentia distinguitur.

TYPUS: Victoria — East Gippsland; Pyramid Creek, *c.* 0.05 km north on the Combienbar road from Club Terrace, 37°32.4′S, 148°56.2′E. Plants massed in narrow pools or runs up to 1 metre deep. Altitude *c.* 90 m. 14 Dec. 1991, *W.M. Molyneux s.n.* (HOLOTYPUS: MEL 705965; ISOTYPI: BRI, CANB, MEL 705964 & spirit material, NSW).

Rhizomes horizontal to vertical, 3.5–18.5 cm long × 4–14 mm diam., bearing long fine soft fibres 2–11 cm long. *Tubers* globular (young one), narrow-ellipsoid or narrow-oblanceolate to elliptic or obovate, or elongated and ± long-cylindrical to narrow-rhomboid and tapered at each end (often twisted or pitted by the gravelly substrate), 11–80(–102) mm long × 2–11 mm diam. (length 1.8–12.5(–20.4) times as long as diam.), terminating roots 25–126(–178) mm long; each root 1.2–7.9 times as long as its tuber. *Leaves* 41–252 cm long × (1–)2–16 mm wide, usually isolateral, non-glossy, semi-translucent and mid-green to reddish-green, completely submerged at or several centimetres below the water surface and often loosely spiralled or with undulate margins (leaves somewhat dorsiventral when stranded, with upper surfaces darker green and ± glossy), linear throughout whole length (including sheathed portion) except tapered distally, acute to narrow-obtuse, thin-textured, not thickened and spongy toward the base, sheathed over the lower (13%–)18%–42% of the leaf length. *T.S. leaf about 3 cm below the sheath summit*: linear to thinly plano-convex, width 4.4–20.7 times the thickness; each side of sheath 1.4–5.2 mm wide, equal *c.* 18%–40% of the leaf width but mostly inrolled so that sheath width when rolled is 1–3.2 mm, equal only *c.* 11%–26% of the leaf width. *Stems* in fruit (19–)29–115 cm long (including the infructescence) × 2–18 mm diameter. *Rachis* 1–10 mm diam. at base, gradually tapered upwards;

rachis and pedicels pale green-cream, rarely tinged maroon-cyclamen. *Infructescence* 5–36 cm long (= (8%–)20%–42% of the total stem length) × 15–30(–35) mm diameter. *Pedicels* often slender, upcurved, 2.5–9 mm long. *Fruits* touching, those on longer pedicels loosely so, those on shorter pedicels more firmly so, (20–)35–232 per rachis, 4–9 per 1 cm of rachis length, ellipsoid to mildly obovate in outline, 9–16 mm long × 5–9.5 mm diameter. *Carpels* 6(or 7), in fruit usually straight and erect but sometimes partly spiralled around each other and then giving a twisted appearance to the fruit, normally all maturing, 8.5–15.5 mm long × 1.6–2.8 mm wide × 2.1–4.6 mm deep; ventral edges attached along their whole length (excluding the beak sinus); attachment length = 63%–70% of carpel length; lateral faces ± flat, adpressed; dorsal ridge typically prominent and narrow-rounded, sometimes broad-rounded and less pronounced, (17%–33% of carpel depth); shoulder ridges inconspicuous before carpels separate and then seen in T.S. to be 0%–16% of carpel width (i.e., non-demarcated to projecting from the lateral faces). (Fig. 1 d & h)

Selected Specimens Examined (total examined = 65)

Queensland — Running Creek, 6 km E of Gympie, Tin Can Bay Road, 7 May 1976, *Jacobs 2522* (BRI, NSW).

New South Wales — Stoney Crossing, Red Head Road, [north of Milton], 25 Oct. 1957, *Constable s.n.* (NSW); Tianjara Falls, between Braidwood and Nerriga, 9 Nov. 1968, *Dunlop 181* (CBG); Nowra to Sassafras road, 19 Oct. 1939, *Hadley s.n.* (NSW); Crawford River [North Coast], 13 Nov. 1895, *Rudder s.n.* (MEL); Clarence River, Nov. 1875, *Wilcox s.n.* (MEL).

Victoria — Brodribb River at Sardine Creek, 14 miles direct line NNE of Orbost, 4 Dec. 1968, *Aston 1666* (CANB, MEL); Tanjil River, *c.* 100–200 m below Blue Rock Lake spillway, *c.* 11 km NNW of Moe, 23 Jan. 1992, *Aston 2842* (BRI, CANB, MEL, NSW); Tributary of Double Creek, *c.* 7 km WNW of Mallacoota, 22 Feb. 1989, *Clarke 1934* (CANB, MEL, NSW); Ferntree Creek, at crossing of the Sardine Creek road, Ellery Forest Block, East Gippsland, 20 Jan. 1987, *Earl 305* (MEL); Genoa River, on road to Wangarabell, 19.3 km NW of Princes Highway, East Gippsland, 24 Oct. 1991, *Ross 3553* & Coles (CANB, MEL, NSW).

Tasmania — Denison River at Ferny Hill Road bridge, 3 Nov. 1980, *Buchanan 300* (HO); Carlton River, 0.5 km down from Arthur Highway, 21 Oct. 1984, *Moscal 8677* (HO).

Distribution (Fig. 5)

Apparently most prevalent south and east of the Great Dividing Range in East Gippsland, Victoria, and in the central- and south-coast regions of New South Wales. Also recorded sparsely through north-coastal New South Wales to south-eastern Queensland (one record only), through Central Gippsland, Victoria, and in Tasmania. A 1965 collection (*P. Saenger s.n.*, MEL) from Yellingbo east of Melbourne is apparently this species and, if so, represents the most westerly record in Victoria.

Habitat

Fresh, gently to swiftly flowing, usually cold clear water to one metre deep in permanent, often rocky, streams and rivers usually subject to severe flooding and water level rises of 3 to 4 metres. Bedrock of sandstone/mudstone. Rhizomes and roots embedded usually in thick sand or gravel substrate, often secured beneath rocks. Occasionally in still residual pools of streambed. Water occasionally tannin-stained. One record each from soft mud, sandy loam, gravel over silt and small stones overlying clay. Sites typically in wet sclerophyll forest with thick shrub understoreys; streamside vegetation recorded includes *Eucalyptus* spp., *Tristaniopsis laurina*, *Tristania neriifolia*, *Acacia mearnsii*, *Callistemon subulatus*, *Calytrix tetragona*, *Hakea microcarpa*, *Carex gaudichaudiana* and *Lomandra longifolia*. Seedlings establish on saturated edge soils.

Generally extends to higher altitudes than other species, commonly occurring between 30 m and 580 m, also recorded at *c.* 970 m (*Henshall s.n.*); occasionally as low as 15 m.

Flowers from August to January. Fruits from September to February, or possibly longer as young seedlings (testas still attached) were collected in February and April.

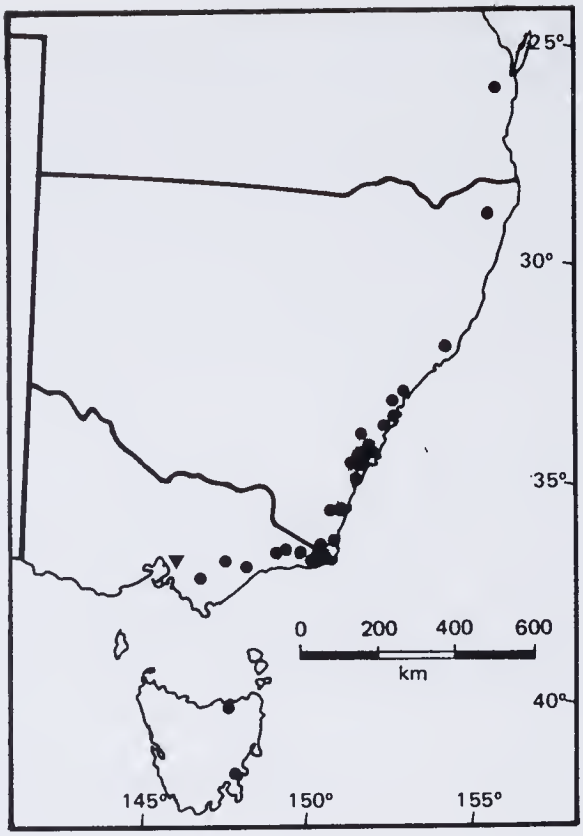

Fig. 5. Distribution map of *Triglochin rheophilum*. (Triangle = a doubtful record).

Diagnosis and Etymology

The long, narrow, linear, thin-textured, non-spongy leaves with narrow leaf sheaths and the fruits of *T. rheophilum* are distinctive. Mature fruits are 9–16 mm long, ellipsoid to mildly obovate in outline, and 4–9 per 1 cm of rachis length. The 6 (or 7) mature carpels are ventrally attached over most of their length, each with a narrow and prominent dorsal ridge. Pedicels are often longer and more slender than in other species.

Robb & Ladiges (1981; p. 645) commented on the distinctive vegetative morphology of this species (= their form D) and grew ten plants on in containers. They found the leaf characters to be apparently stable, a finding which indicates that these characters are genetically rather than environmentally controlled. My field observations (*q.v.*) support this conclusion.

The epithet *rheophilum* indicates the restriction of this species to clear, often swiftly flowing, non-polluted, flood-prone streams and rivers.

Field Observations

Vegetative plants of *T. rheophilum* (*Aston 2812*) were collected from Wonboyn Creek, New South Wales, only 1 metre from fruiting plants of an east coast variant of *T. procerum* (*Aston 2811*). They were completely submerged in 1 metre or more of strongly flowing water and showed typical thin, non-spongy leaves with narrow leaf sheaths. The plants of the *T. procerum* variant were also in flowing, although shallower, water 20–30 cm deep but showed typical erect, well-emergent leaves with thick, spongy, more or less semi-cylindrical bases and very broad,

overlapping sheaths. There was no sign of any intermediacy between the two species.

Because of the submerged habit and thick foliage masses trailing downstream, infructescences of *T. rheophilum* are often hidden beneath the foliage where they, too, trail downstream.

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